THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

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Extraterritoriality

By George E. Sokolsky

SADAO SABURI

PEOPLES' EFFORTS FOR PEACE

By Kennoske Sato

THOMAS A. EDISON

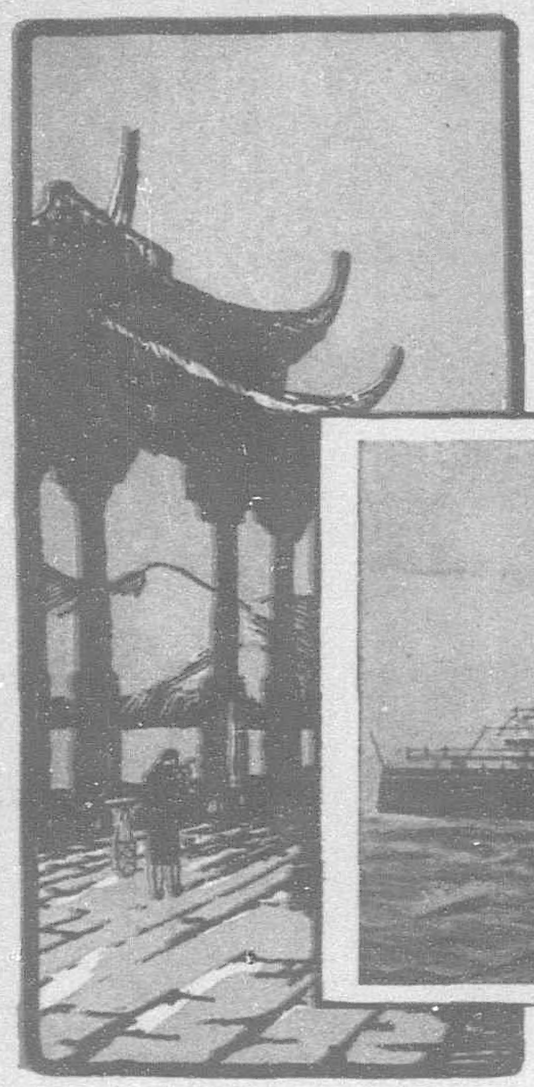
By J. W. Grieve

CHINA'S INTERNAL LOAN OBLIGATIONS

By E. Kann

Vol. XXV September, 1929 No. 9

SHANGHAI, PEKING, TOKYO AND MANILA



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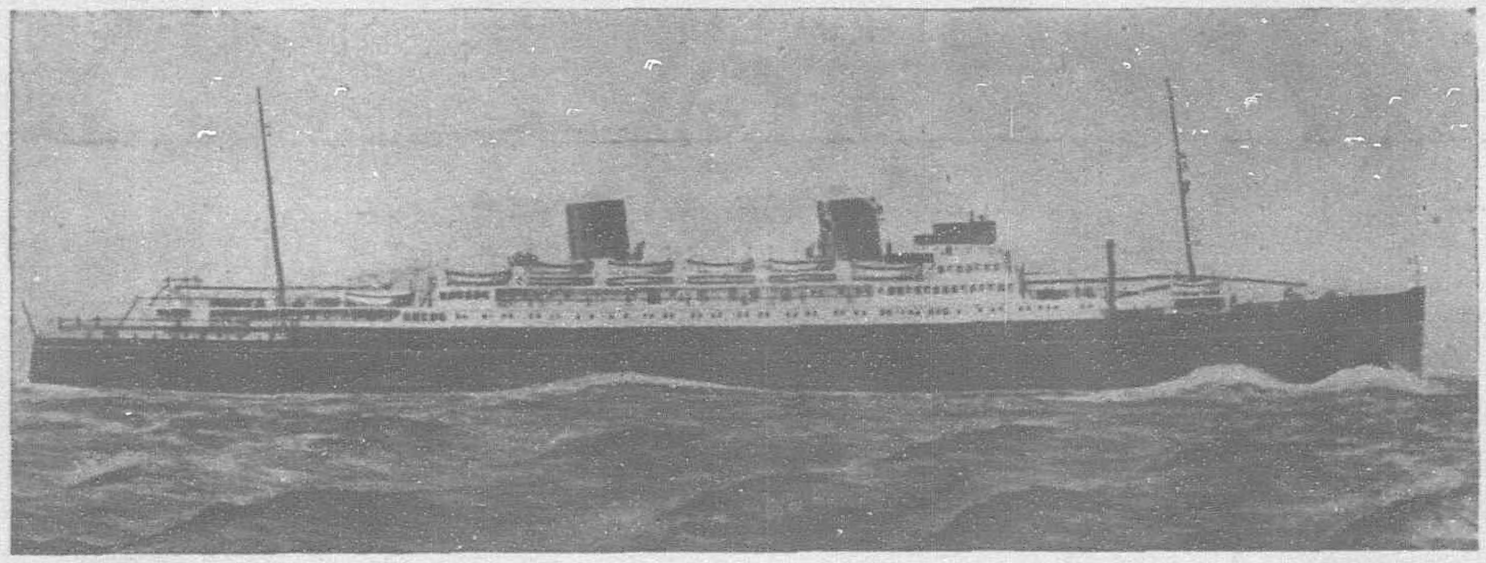

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ENGINEERING FINANCE COMMERCE

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Extraterritoriality

By GEORGE E. SOKOLSKY

THE publication of the American reply to China's demand for the abolition of extraterritoriality came as a shock to most Chinese, because the Chinese people had been led to believe that although the replies from the Powers were not altogether satisfactory, there was hope that a second Chinese Note on the subject might achieve the desired result. When the American note was actually published and subsequently when the British as well as the other notes appeared in the press, the Chinese people realized that they had been misled, that the replies were forceful and, for the present, definite and that there was little hope for a change in sentiment or purpose on the part of the Powers in the immediate future.

The error lay with the Nanking Government in suppressing the facts, so that the Chinese people were not adequately informed as to the general foreign attitude. Sincere friends of China have, during the past year, been assiduous in informing the Chinese people that this was not the year for a consideration of the extraterritoriality problem. False friends, paid propagandists, and panders, have been creating mirages, which pleased some Chinese but ultimately brought nothing but disappointment and to some extent, humiliation.

The untimeliness of the extraterritoriality proposal was apparent from the general facts of the situation. All the great Powers favor the abolition of extraterritoriality because it is admittedly a cumbersome and inequitable system. Each of the Powers would prefer to dignify China's position so that China might take the place due to a nation possessing such territory, resources and population. The question, however, which has faced each one has been to find a procedure to meet China's aspirations and at the same time to afford that protection to life and property which alone can prevent a loss of the huge capital investments which have already been made in China and at the same time prevent a straining of relations by the recurrence of incidents which might lead, in ordinary circumstances, to the necessity of armed intervention. The report made by the Commission for the Abolition of Extraterritoriality, of which Silas Strawn was the Chairman, and to which reference has often been made in these pages, afforded just such an interim procedure. Although, when the report and the recommendations were signed, China agreed to them, the present administration in Nanking finds them umbrageous and seeks to meet the problem by the passage of legislation by the Legislative Yuan. Unfortunately, it does not seem to be evident to the Chinese, as it is to almost everyone else, that the mere codifying of laws is not the solution: it is the administration of the law that worries the foreigner. No nation, no matter how excellent its intentions, could hope to achieve a satisfactory administration of the law in one year after centuries of maladministration. There is nothing wrong or unworthy in China's desire that extraterritoriality should be abolished; there is nothing unfair or unjust in China's insistence upon equality. But it is an error of judgment, an indication of a lack of political wisdom, a misunderstanding of the institution of extraterritoriality to imagine that its *immediate* and *sudden* abolition can benefit the Chinese people or the foreigners who live in China and have invested their money in this country.

Mr. Hu Han-min, Chairman of the Legislative Yuan, who is one of China's most astute statesman, missed the point altogether in his statement at the Monday morning memorial service on August 12. He said:

> "Whatever they may say about their friendship for China and the Chinese people, when it comes to the question of curtailing their so-called acquired rights and privileges in this country, the Imperialist Powers will at once put on their ferocious look. There is no country which really treats China on a footing of absolute equality. The other day a foreign diplomat called on me and brought up the question of Extraterritorality. He said that the Powers have no objection to the Chinese demand for the abolition of Extraterritoriality in principle but that some time will elapse before they consent to place their nationals under Chinese jurisdiction. He then proceeded to point out the imperfections of the Chinese judicial system.
>
> "I at once asked him to deal with the alleged imperfections of the Chinese judiciary and laws in more specific terms and also asked him if in his opinion the kind of justice administered in China's foreign Concessions and Settlements is better than that administered by Chinese courts. All human institutions are imperfect, and if you are out to find faults, certainly you can find many holes in the Chinese judicial system. If I were to pass on the judicial administration of our country, or for that matter, that of any other foreign country, I could find many faults and easily make out a case why Chinese should not be subject to your jurisdiction. If you want to wait for the surrender of your Extraterritoriality until China's laws and her administration of justice have reached such a stage as to meet with the unanimous approval of the world's leading jurists, then extraterritoriality will never be abolished in China."

Mr. Hu should not question the sincerity of the friendship of the Powers for China. Surely, the United States, Great Britain and Japan are sincere in their expressions of friendship. They want China's trade and they know that trade must have as its basis, goodwill and friendship. Since 1925, they have indicated, by their unwillingness to use armed force to intervene in China's affairs, a fullness of friendship the history of which is not yet at an end. But it is a moot question as to whether it is not an act of friendship to China to reject the demands for the abolition of extraterritoriality at the present time. For after a decade of civil war, after the intense revolutionary activity of the past five years, even the best friends of China, must admit that the National Government has not had the time and the opportunity to create the institutions or develop the administration which the abolition of extraterritoriality would require. That that was evident to the Powers is quite clear from the American and British notes on the subject, which are couched in unmistakably friendly language and which indicate a solution to the problem.

That solution is internal reorganization and reconstruction. China may win a thousand victories in the field of diplomacy; China may even succeed in abolishing extraterritoriality, but if the people of China labor under injustices and an inequable administration of the courts, trade, industry and the welfare of the country, will suffer. The mere codification of laws solves no problem: the laws must be administered and enforced. The adaptation of laws from Japan, France, Austria or any other country does not in itself add one whit to the development of China, for those laws cannot and are not enforcable in China. In a word, the change over from a government by whim to a government by law involves

a complex and difficult process of political education and psychological development. If the Government at Nanking set itself to that task, it will not, in time, fail in its effort to achieve the abolition of extraterritoriality. Success is certain as soon as there is a government by law. And by that no one means American law or British law or French law. Whatever the law may be, if there is a law and if there is a definitive, certain administration, without respect for persons and positions, equal for Chinese and foreigners alike, then there will no longer be an excuse for extraterritoriality. This idea is made unmistakable in both the American and British Notes which follow:

The American Note

Peking, August 10, 1929.

Excellency:

I have the honor to acknowledge the receipt of the Chinese Government's note of April 27 in which there is expressed the desire that the United States should relinquish the further exercise of extraterritorial jurisdiction over its citizens in China and the hope that the American Government will take this desire into immediate and sympathetic consideration.

I am directed by my Government to state that it is prepared to give sympathetic consideration to the desires expressed by the Chinese Government, giving at the same time, as it must, due consideration to the responsibilities which rest upon the Government of the United States in connection with the problem of jurisdiction over the persons and property of American citizens in China. My Government has, in fact, for some time past, given constant and sympathetic consideration to the national aspirations of the people of China, and it has repeatedly given concrete evidence of its desire to promote the realization of those aspirations in so far as action of the United States may contribute to that result. As long ago as the year 1903, in Article 15 of the treaty concluded in that year between the United States and China, the American Government agreed that it would be prepared to relinquish the jurisdiction which it exercised over its nationals in China "when satisfied that the state of the Chinese laws, the arrangements for their administration, and other considerations warrant it in so doing." As recently as last year, the American Government gave very definite evidence of its desire to promote the realization of China's aspirations by concluding with the Government of China, on July 25, 1928, a treaty by which the two countries agreed to the cancellation of provisions in earlier treaties whereby China's authority in reference to customs duties on goods imported into China by American nationals had been restricted.

The exercise by the United States of jurisdiction over its citizens in China had its genesis in an early agreement that, because of differences between the customs of the two countries and peoples, and differences between their judicial systems, it would be wise to place upon the American Government the duty of extending to American nationals in China the restraints and the benefits of the system of jurisprudence to which they and their fellow nationals were accustomed in the United States.

My Government deems it proper at this point to remind the Government of China that this system of American jurisdiction as administered by the extraterritorial courts has never been extended by the United States beyond the purposes to which it was by the treaties originally limited. Those purposes were the lawful control and protection of the persons and property of American citizens who have established themselves in China in good faith in accordance with the terms of the treaties and with the knowledge and consent of China in the normal development of the commercial and cultural relations between the two countries. The United States has never sought to extend its sovereignty over any portion of the territory of China.

Under the provisions of the treaty of 1844, and other agreements concluded thereafter which established that system, American citizens have lived and have carried on their legitimate enterprises in China with benefit both to the Chinese and to themselves. They have engaged extensively in cultural and in commercial enterprises involving large sums of money and extensive properties, and, as your Government has so graciously indicated in the note under acknowledgment, there has grown up and existed between the peoples and the Governments of the two countries a friendship that has endured. The American Government believes that this condition of affairs has been due in large part to the manner in which the relations between the two peoples have been regulated under the provisions of these agreements, the existence of which has assured to the lives and property of American citizens in China the security so necessary to their growth and development.

For the safety of life and property, the development and continuance of legitimate and beneficial business depend in the last resort, in China, as elsewhere, upon the certainty of protection from injury or confiscation by a system of known law consistently interpreted and faithfully enforced by an independent judiciary. Where such protection fails, the life and liberty of the individual become subject to the constant threat of unlawful attack, while his property suffers the ever-present danger of confiscation in whole or in part through arbitrary administrative action. To exchange an assured and tried system of administration of justice, under which it is acknowledged that life and property have been protected and commerce has grown and prospered, for uncertainties in the absence of an adequate body of law and of an experienced and independent judiciary would be fraught with danger in both of the foregoing respects.

My Government has instructed me to say that the statement of the Minister of Foreign Affairs of China, telegraphed to the press of the United States on July 26, to the effect that "all foreign interests in China purely for legitimate purposes will be duly respected" has been noted by it with pleasure as indicating that the Government of China has not failed to appreciate the value to its foreign relations of the factors above mentioned. My Government bids me add that it is therefore persuaded that the Government of China will concur in its belief, based as it is upon the facts set forth in succeeding paragraphs, that the sudden abolition of the system of protection by its extraterritorial courts in the face of conditions prevailing in China to-day would in effect expose the property of American citizens to danger of unlawful seizure and place in jeopardy the liberty of the persons of American citizens.

The Chinese Government has, on several occasions during recent years, expressed the desire that the Powers relinquish the exercise of extraterritorial jurisdiction over their citizens. In the note under acknowledgment reference is made to the position taken at the Washington Conference. It will be recalled that, in pursuance of the resolution adopted at that Conference, there was created a Commission to inquire into the present practice of extraterritorial jurisdiction in China and into the laws and the judicial system and the methods of judicial administration of China, and that, under date of September 16, 1926, that Commission made its report. This report contained an account of the conditions then prevailing in the judicial system of China, as well as a number of recommendations carefully suggested as indicating the changes and improvements which would be necessary before there would be adequately developed a system of known law and an independent judiciary capable of justly controlling and protecting the lives and property of the citizens of foreign countries doing business in China. Your Government will recall that the Commission on Extraterritoriality which made these recommendations was composed of representatives from thirteen countries including both China and the United States and that its recommendations thoughtfully and reasonably conceived were unanimously adopted and were signed by all of the Commissioners.

Because of its friendship for the Chinese people and its desire, to which allusion has been already made, to relinquish as soon as possible extraterritorial jurisdiction over its own citizens in China, my Government has followed with attentive consideration this entire subject, including particularly the progress which has been made in carrying out its recommendations since the rendition of this report. It fully appreciates the efforts which are being made in China to assimilate these western juridical principles to which your Government has referred in its note, but it would be lacking in sincerity and candor, as well as disregardful of its obligations towards its own nationals, if it did not frankly point out that the recommendations aforesaid have not been substantially carried out and that there does not exist in China to-day a system of independent Chinese courts free from extraneous influences which is capable of adequately doing justice between Chinese and foreign litigants. My Government believes that not until these recommendations are fulfilled in far greater measure than is the case to-day will it be possible for American citizens safely to live and do business in China and for their property adequately to be protected without the intervention of the consular courts.

In conclusion, my Government has directed me to state that it observes with attentive and sympathetic interest the changes which are taking place in China. Animated as it is by the most friendly motives and wishing as far as lies within Government power to be helpful, the American Government would be ready, if the suggestion should meet with the approval of the Chinese Government, to participate in negotiations which would have as their object the devising of a method for the gradual relinquishment of extraterritorial rights, either as to designated territorial areas, or as to particular kinds of jurisdiction, or as to both, provided that such gradual relinquishment proceeds at the same time as steps are taken and improvements are achieved by the Chinese Government in the enactment and effective enforcement of laws based on modern concepts of jurisprudence.

I avail myself of this opportunity to extend to Your Excellency the renewed assurance of my highest consideration.

(Signed) J. V. A. MacMurray.

His Excellency
Dr. Chengting T. Wang,
Minister for Foreign Affairs,
Nanking.

The British Note

Peking, August 10.

His Excellency
Dr. C. T. Wang,
Minister for Foreign Affairs,
Nanking.

Sir,—I have the honor to acknowledge the receipt of your Note of April 27, in which you informed me of the desire of the Nationalist Government of the Republic of China that the restrictions imposed on the Jurisdictional sovereignty of China by the system of Extraterritoriality now in force should be removed at the earliest possible date with a view to the assumption of jurisdiction by China over all nationals in her domain.

I have communicated the contents of your letter to my Government, and I am now instructed to transmit to you a reply in the following sense.

Animated by the friendly feelings which they have always entertained towards the Government and people of China, His Majesty's Government have given their sympathetic consideration to the request of the Chinese Government relating to the abolition of extraterritorial jurisdiction in China. The high importance of this subject in its bearing both on the political development of China and the future relations between

China and Great Britain appears to demand that it should be closely examined from every aspect. In particular, a just appreciation of the reasons for which and the manner in which the present system of extraterritoriality came into existence seems essential to a consideration of the proper method for dealing with the problem.

The system of extraterritoriality in force in China has its roots deep down in the past.

For thousands of years before science had improved communications, the Chinese people were secluded from the rest of the world by deserts and the ocean, and they developed a civilization and a polity peculiar to themselves. A wide gulf was thus fixed between Europe and America on the one hand and China on the other.

In particular, the conception of international relations as being the intercourse between equal and independent States—a conception which was woven into the very texture of the political ideas of the nations of the West—was entirely alien to Chines modes of thought. When the traders of the West first found their way to the coast of China, the Chinese Government found it difficult to allow them freely to enter into their country and mingle with their people. Nor did they recognize that the nations to which they belonged were the equals of China. These traders were therefore confined to a small section of a single city in one corner of the Empire, and while on the one hand they were subjected to many disabilities and to grave humiliations, on the other hand, by a species of amorphous and unregulated extraterritoriality which was the natural outcome of these conditions, the responsibility of managing their own affairs and maintaining order amongst themselves was in some measure left to their own initiative.

The relations continued for many years upon this insecure and unsatisfactory footing. Friction was often dangerously intense and conflicts not infrequently arose, generally out of demands that some innocent person should be surrendered for execution to expiate perhaps an accidental homicide, or that foreign authority should assume the responsibility for enforcing the revenue laws of China.

The object of the first treaties was to secure recognition by China of Great Britain's equality with herself and to define and regulate the extraterritorial status of British subjects. The relations between the two countries having thus been placed on a footing of equality and mutual respect, Great Britain was content that her nationals should continue to bear those responsibilities and to labor under those disabilities which respect for the sovereignty of China entailed upon them. Conditions did not permit the general opening of the interior of China, and the residence of foreigners has consequently continued down to the present day to be restricted to a limited number of cities known as Treaty Ports.

His Majesty's Government recognize the defects and inconveniences of the system of Consular jurisdiction to which the Government of China have on various occasions drawn attention. In 1902, in Article XII of the Treaty of Commerce between Great Britain and China signed in that year, His Majesty's Government stated their readiness to relinquish their extraterritorial rights when they were satisfied that the state of Chinese laws, the arrangements for their administration, and other considerations warranted them in so doing. They have since watched with appreciation the progress which China has made in the assimilation of Western legal principles, to which reference is made in your Note under reply, and they have observed with deep interest the facts set out and the recommendations made in the report of the Commission on Extraterritoriality in the year 1926.

More recently, in the declaration which they published in December, 1926, and the proposals which they made to the Chinese authorities in January, 1927, His Majesty's Government have given concrete evidence of their desire to meet in a spirit of friendship and sympathy the legitimate aspirations of the Chinese people. They have already travelled some distance along the road marked out in those documents, and they are willing to examine, in collaboration with the Chinese Government, the whole problem of extraterritorial jurisdiction with a view to ascertaining what further steps in the same direction it may be possible to take at the present time.

His Majesty's Government would however observe that the promulgation of codes embodying Western legal principles represents only one portion of the task to be accomplished before it would be safe to abandon in their entirety the special arrangements which have hitherto regulated the residence of foreigners in China. In order that those reforms should become a living reality, it appears to His Majesty's Government to be necessary that Western legal principles should be understood and be found acceptable by the people at large no less than by their rulers, and that the courts which administer these laws should be free from interference and dictation at the hands not only of military chiefs but of groups and associations who either set up arbitrary and illegal tribunals of their own or attempt to use legal courts for the furtherance of political objects rather than for the administration of equal justice between Chinese and Chinese and Chinese and foreigners. Not until these conditions are fulfilled in a far greater measure than appears to be the case to-day will it be practicable for British merchants to reside, trade and own property throughout the territories of China with the same equality of freedom and safety as these privileges are accorded to Chinese merchants in Great Britain. Any agreement purporting to accord such privileges to British merchants would remain for some time to come a mere paper agreement to which it would be impossible to give effect in practice. Any attempt prematurely to accord such privileges would not only be of no benefit to British merchants but might involve the Government and people of China in political and economic difficulties.

So long as these conditions subsist there appears to be no practicable alternative to maintaining though perhaps in a modified form, the treaty-port system that has served for nearly a century to regulate intercourse between China and British subjects within her domain. Some system of extraterritoriality is the natural corollary for the maintenance of the treaty-port system and the problem as it presents itself to His Majesty's Government at the present moment is to discover what further modifications in that system beyond those already made and alluded to above it would be desirable and practicable to effect.

His Majesty's Government await further proposals from the Nationalist Government as to the procedure now to be adopted for examining this question, and they instruct me to assure your Excellency that they will continue to maintain towards any such proposals the same friendly and helpful attitude to which Your Excellency has paid so generous a tribute in the concluding paragraph of your Note under reply.

I avail myself of this opportunity to renew to Your Excellency the assurance of my highest consideration.

(Sgd.) MILES W. LAMPSON.

Dr. Wang Replies

Dr. C. T. Wang's reply to these notes is most interesting. In the first place the tone is completely changed; China does not demand *immediate* abolition as a right but as a mark of friendship. China does not threaten but she does plead. Undoubtedly the reason for this change is the unfortunate fact that although all the world sympathizes with China in the present C.E.R. struggle, China's diplomacy has served to throw the weight of public opinion on the other side. China must, in her own interest, cease to threaten the foreign Powers, for a threat is useless unless supported by force. Dr. Wang's second note on extraterritoriality is a wiser and saner document than his first note or his previous speeches on the subject. It does not create a feeling of unfriendliness where normally there is friendship.

Dr. Wang raises a question in his note which is easily answered. He suggests that those nations which do not enjoy extraterritoriality have the friendship of the Chinese people, while those who do enjoy this privilege are losing that friendship. There may be many tests of friendship, but, in China, the acid test is trade, for the foreigners come to China essentially to trade. A comparison between those nations that enjoy extraterritoriality and those that do not would be interesting. Let us take the four leaders in each group and make a comparison for the year 1928.

Four Countries enjoying extraterritoriality.

Great Britain	Hk. Taels	699,470,229
Japan	,,	612,796,960
United States of America	,,	334,370,213
France	,,	111,505,293
Total	Hk. Taels	1,758,142,695

which is more than 75 per cent. of the whole foreign trade, which in 1928 amounted to Hk. Taels 2,187,324,259.

Nine Countries which do not enjoy extraterritoriality.

Germany	Hk. Taels	78,521,531
Russia	,,	118,293,722
Turkey, Persia, Egypt, Aden, etc.	,,	34,257,992
Austria, Hungaria and Czecho-Slovakia	,,	697,707
Making a total of	Hk. Taels	231,770,952

or approximately 10 per cent. of the total.

Dr. C. T. Wang's second note to the American Government follows:

Nanking, September 5.

Monsieur le Ministre; I have the honor to acknowledge the receipt of Your Excellency's Note of August 10, in which you are good enough to submit to me the views of your Government in regard to the request of the Chinese Government contained in my Note of April 27 for the removal of restrictions on Chinese jurisdictional authority.

The Chinese Government is pleased to be reminded by the American Government that it has for some time past given constant and sympathetic consideration to the national aspirations of the people of China, and that it has repeatedly given concrete evidence of its desire to promote the realization of those aspirations.

The traditional friendship between China and America has not only a common material basis, but is also deeply rooted in the idealism which is common to the Chinese and the American peoples. The American people with their love of liberty, their zeal for justice, their desire to further the advance of civilization and their sympathy for the aspirations of nations in their spiritual rebirth, all of which reveal unmistakeably the noble attitude of the American mind, have won the admiration and love of the Chinese people.

This idealism has manifested itself in the abolition of slavery, the growth of democracy and the endeavor to establish a reign of universal peace, which has given new hope to the human race. It is this idealism

that accounts for the steadfastness of the American Government and people in their friendship for China through all vicissitudes of her fortune.

It is again this idealism that has prompted the American Government to give sympathetic consideration to the desire of the Chinese Government in connection with the question of jurisdiction, and to decide to enter into negotiations for the revision of the latter, leading to the eventual abolition of extraterritorial privileges.

It seems to me, however, from a careful consideration of your note, that the American Government is not yet freed from misgiving as to the safety of American life and property after the abolition of extraterritoriality. The American Government is undoubtedly aware of the fact that the liberty of American citizens and the security of their property rights do not so much depend upon the continued exercise of jurisdiction by their own Consular Courts as upon the timely removal of hindrances to the free and full ascertion of China's sovereign rights.

Extraterritorial privileges, while apparently beneficial to foreigners in China in giving them the impression of security and safety, have really had the most injurious effect on their relations with the Chinese by producing in the latter a feeling of humiliation and a sense of resentment, which have always caused mutual suspicion and consequent loss of mutual confidence; thus undermining the very foundation of friendly relations, and not infrequently giving rise to complications and conflicts.

Such conflicts and complications could easily be avoided were there none of those special privileges. In this connection, it may be pointed out that for those nationals of certain countries who have lost their extraterritorial privileges and have submitted to the jurisdiction of China the Chinese people entertain the most friendly feelings and repose in them great confidence; a valuable asset, it will be admitted, in the intercourse, commercial or otherwise, of any two peoples.

Such marked differences in the relations between the Chinese and the nationals of extraterritorial Powers on the one hand, and between the Chinese and the nationals of non-extraterritorial Powers on the other, will, as long as the extraterritorial system is retained, become more and more pronounced, and much as the Chinese Government may try to discountenance this difference of attitude on the part of its citizens, it is not within its power to control natural expressions of their feelings.

In the event, however, of American citizens relinquishing their extraterritorial privileges they may rest assured that they will enjoy the same confidence of the Chinese peoples and hence the same material benefits as the nationals of non-extraterritorial Powers. Moreover, the Chinese Government will continue to exercise, in accordance with the well-established principles of international law, due diligence in preventing any possible violation of the civic private rights of American citizens and will perform its duties in the fullest possible measure in all matters relating to the redress of wrongs.

In your Note under acknowledgment reference is made to the report of the Commission on Extraterritoriality, submitted to the interested governments pursuant to a resolution adopted at the Washington Conference. The American Government must be aware of the fact that since the completion of that report, conditions in China have greatly changed, and, in particular, both the political and judicial system have assumed a new aspect.

To pass judgment on the present state of laws and judicial administration in China in the light of what is contained in the report of 1926, is doing no justice to the steadfast quality of the National Government.

At this point it may be worth while to recall the circumstances under which the American Government denounced its rights under the Capitulations with Turkey. The Chinese judicial system, it will be admitted, does not suffer the least in comparison with that of Turkey at the time of the abolition of the Capitulations.

(Continued on page 395).

Sadao Saburi

Japanese Minister to China

MR. Sadao Saburi as Japanese Minister to China will be welcomed by all residents in China as a worthy successor to Mr. Yoshizawa who proved to be so popular and successful. Mr. Saburi is no new man to China. He has seen much service in Peking. As chief of the Treaty Division of the Japanese Foreign Office, he has been of tremendous service to both Japan and China during the difficult negotiations over the Sino-Japanese Commercial Treaty which is not yet concluded. During the trying days of 1926-7, he visited South China, to determine the value and force of the new movement and held numerous conferences in Hankow with Mr. Eugene Chen, which served to create better relations between the Nationalists and the Japanese.

The relations between China and Japan have constantly been improving as more and more Chinese realize that the welfare of China depends upon friendship with Japan. During the past decade, certain elements among the Chinese have utilized anti-Japonism either to weaken the Chinese Government or to divert attention from the mismanagement of the internal affairs of China to international relations. In spite of every effort that has been made to involve Japan in aggressive actions by threat and provocations, the Japanese have invariably kept their promises to China and the world to limit their military activities in China to the safeguarding of Japanese life and property. Nothing can prove this better than the withdrawal of the Japanese troops from Shantung which was delayed at the request of the Nanking Government but which finally took place as agreed upon.

Mr. Sadao Saburi, Japanese Minister to China

The development of Sino-Japanese friendship is more a matter of peoples than of Governments. The Chinese people, the really responsible people, the merchants, the bankers, the bourgeoisie, are friends of Japan. That friendship has been created by decades of trade and contact between modern Japan and modern China. It is true that radical elements have at various times, sought to disturb these wholesome relations and that foreign supporters of Chinese radicalism have also attempted to foment strife and misunderstanding but in the end the normal condition of friendship survives, as healthy institutions usually survive.

Mr. Saburi is particularly fitted to foster and strengthen this friendship. He understands the Chinese, he appreciates their problems and idiosyncracies; he has a broad understanding of human history and the inevitability of error and temper among those who strive for achievement but are constantly pulled backward by the traditions and psychological habits of centuries. And after all, that is China's condition. The aroused masses of China are conscious of their unequal position. They would like to leap over centuries but they are held back, bound like Prometheus by the chains of mandarinism and militarism. When China is unfettered, when these chains are loosened, China will be an equal among the family of nations.

Thomas Alva Edison

His Life and Work

By J. W. GRIEVE, Sales Manager, China General Edison Co., Inc.

The "FAR EASTERN REVIEW" joins with engineering journals in celebrating the jubilee of Thomas Edison's greatest invention, the Incandescent Lamp. The following article by J. W. Grieve, Sales Manager of the China General Edison Company, Inc., is published as a mark of respect for the world's greatest inventor.

We take this opportunity to welcome to the Far East the Engineers of all nations who are about to attend the World Engineering Congress in Tokyo.

FROM genealogy we learn the Edison family sailed from their native Holland and landed in the United States of America about the year 1730. We also know they were gifted with longevity, one Thomas Edison reaching the astonishing age of 104 years. During the revolution the Edison family were stoutly for the Continental cause.

In the belief that Canada held out more prospects the family shifted there; however, their stay was short and in 1842 emigrated back to the States, coming to rest this time in the little town of Milan, Ohio.

Milan at this period was in a flourishing way and developing rapidly as a transhipping center for grain. There were no railways and little prospects of any materializing, so the production of the Western States were carried in waggon loads into Milan and shipped from there over Lake Erie to the East. Consequently, Samuel Edison, the father of the great inventor, set up a workshop there and carried on an exceptionally fine business at times.

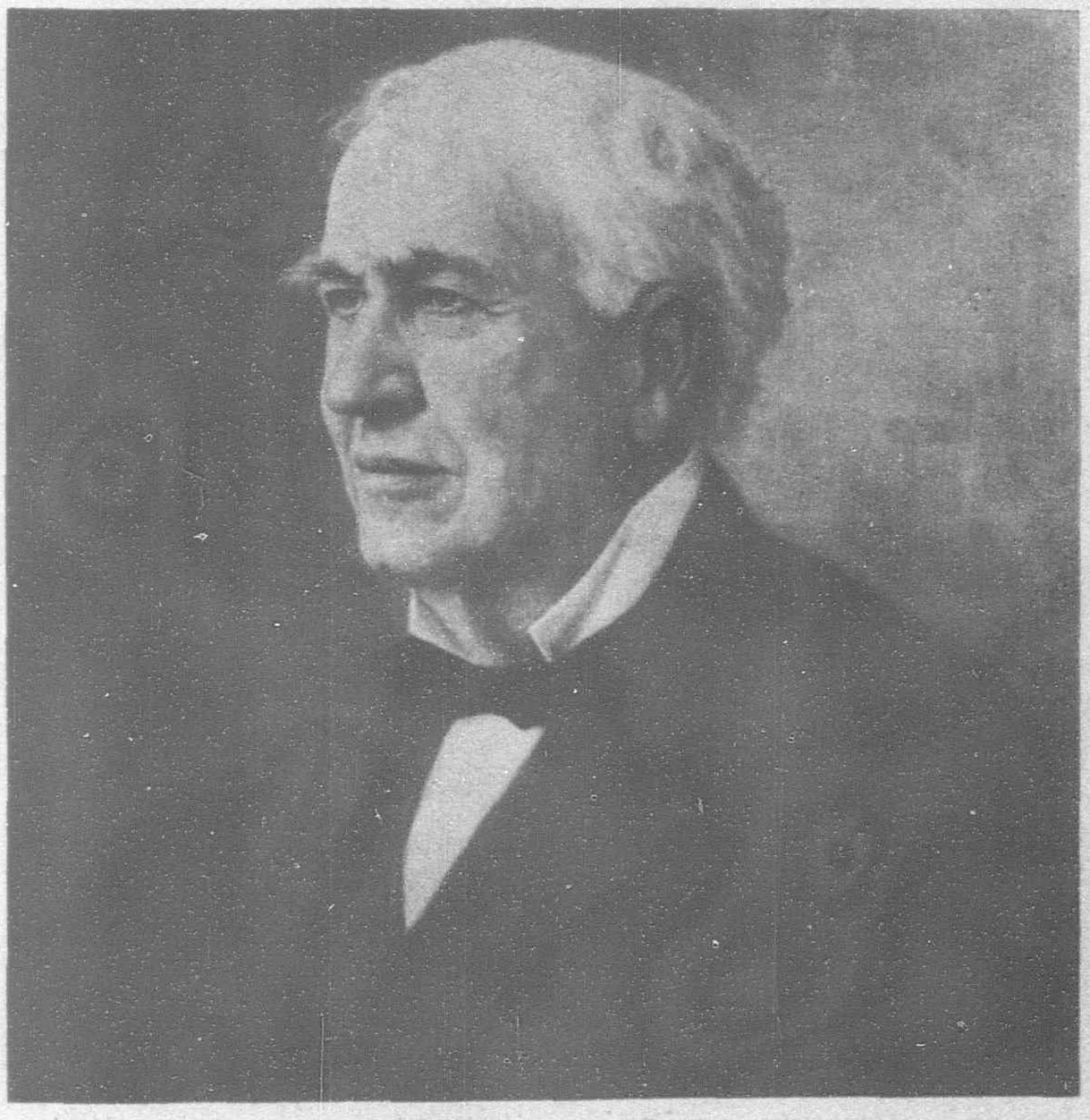
In this little town Thomas Alva Edison was born in the month of February 1847. The name Alva, it is interesting to note, was given in honor of Captain C. A. Bradley, a friend of Samuel Edison and a local shipowner of some considerable importance.

In these early days Edison was a frail and delicately moulded child, perennially occupied with little constructive tasks. He had a grave old-fashioned manner and would solemnly and persistently ask questions. At school, however, the tone of things were different and he was reported as being "addled" or useless. With not a little indignity his mother—a lady of no mean education herself—cancelled further attendance at the school and took up the reins of the pedagogue herself, and before the age of twelve young Edison had digested Hume's "History of England," "The Decline and Fall of the Roman Empire" and Parker's "School Philosophy." This latter edition was Edison's first introduction to physics and many were the experiments he attempted.

As a boy he had his ups and downs like every other of his kind and some amusing stories are told about this phase of this life. One day in his babyhood following a rapt observation of a goose laying eggs he suddenly and mysteriously vanished. Some time later he was discovered in a barn sitting on some eggs determined to hatch a chicken also. Sometimes, those pranks were nothing else but a quest after knowledge. He filled a chore boy employed by his father, one by name of Michael Oates, with seidletz powders to see if he would rise; needless to say Michael required general attention and the youthful Edison was whipped with a switch kept behind the clock specifically for that purpose. And once while holding a skate strap a cronie chopped the point of his finger off in an attempt to cleave the leather.

His first laboratory was in the cellar of his father's house, and to keep people from handling his bottles he labelled them all poison. All his pocket money went in chemicals and mechanical gear. This laboratory with its tale of boyish tubes and tests had a subsequent value in his storage battery experiments.

During these periods, however, with the advent of a railway, Milan's prospects waned commercially; the grain business as prosperous as ever, closed its doors on local shipping merchants, so with the lapse of trade the Edison family moved for the third time to Port Huron, Michigan. It was while residing in this town that Edison set up his "laboratory on wheels." Port Huron was the terminus of the Detroit Southern Railway and was a journey of roughly two and a half hours from the capital. In need of occupation Edison applied for the position as news-boy on the train and was accepted. To Edison in these days two and a half hours was a journey of no mean length and with nothing to do was infinitely longer, so, with the permission of the conductor he got part of an empty baggage car and installed his bench and bottles; a laboratory which eventually expanded into a miniature printing office. Initiative indeed was his, for in addition to his quest in physics he edited and printed a paper which he called the "*Weekly Herald*," a script with a circulation of over four hundred copies. All was well until one night he accidentally set the baggage car on fire. He was bundled out, laboratory, printing press and all, with a ringing cuff on the ears. That cuff was the cause of the deafness which followed him through life.



Thomas A. Edison

Never lost for ideas, with his mother's permission, he reorganized his printing press and laboratory in the cellar of his new home and carried on the "*Weekly Herald*." On the advice of a chum he supplemented its pages with critical reviews of local personalities a daring piece of work, considering his age, experience and writing ability, so daring, in fact, that one highly indignant citizen roused to a fury after reading the chronicles of the "*Paul Pry*," as the new paper was termed, pitched editor and publisher into the Saint Clair River. Shortly afterwards the paper ceased to be issued.

It was the result of an incident which happened in 1862 in Mount Clemens Railway Station which marked the turning point in Edison's career. A telegraphist's son, one by name of Mackenzie, fell foul of a trolley car which by accident had been set in motion with no one on board. With that characteristic smartness, young

Edison dashed across the track and lifted the child to safety by inches. In return for the deed the father of the child, already well known to Edison, offered to teach him telegraphy. In four months he had mastered the key to the extent of running in a not incompetent way a signal box on his own. And so he commenced a career as an electrical operator with the Grand Trunk Railway at Stratford Junction, Ontario, at the age of sixteen. It was here he invented his first practical mechanism. Seemingly, the operators on that line were required to report to headquarters every hour during the night as a safeguard that they were in and awake. Working at his experiments in his off-duty time during the day Edison found it necessary to have some sleep at night, so he devised a contrivance of a clock in conjunction with a notched wheel which automatically answered the call at the required time. One night, however, headquarters called in the interim and he was consequently found asleep. Needless to say he was severely reprimanded.

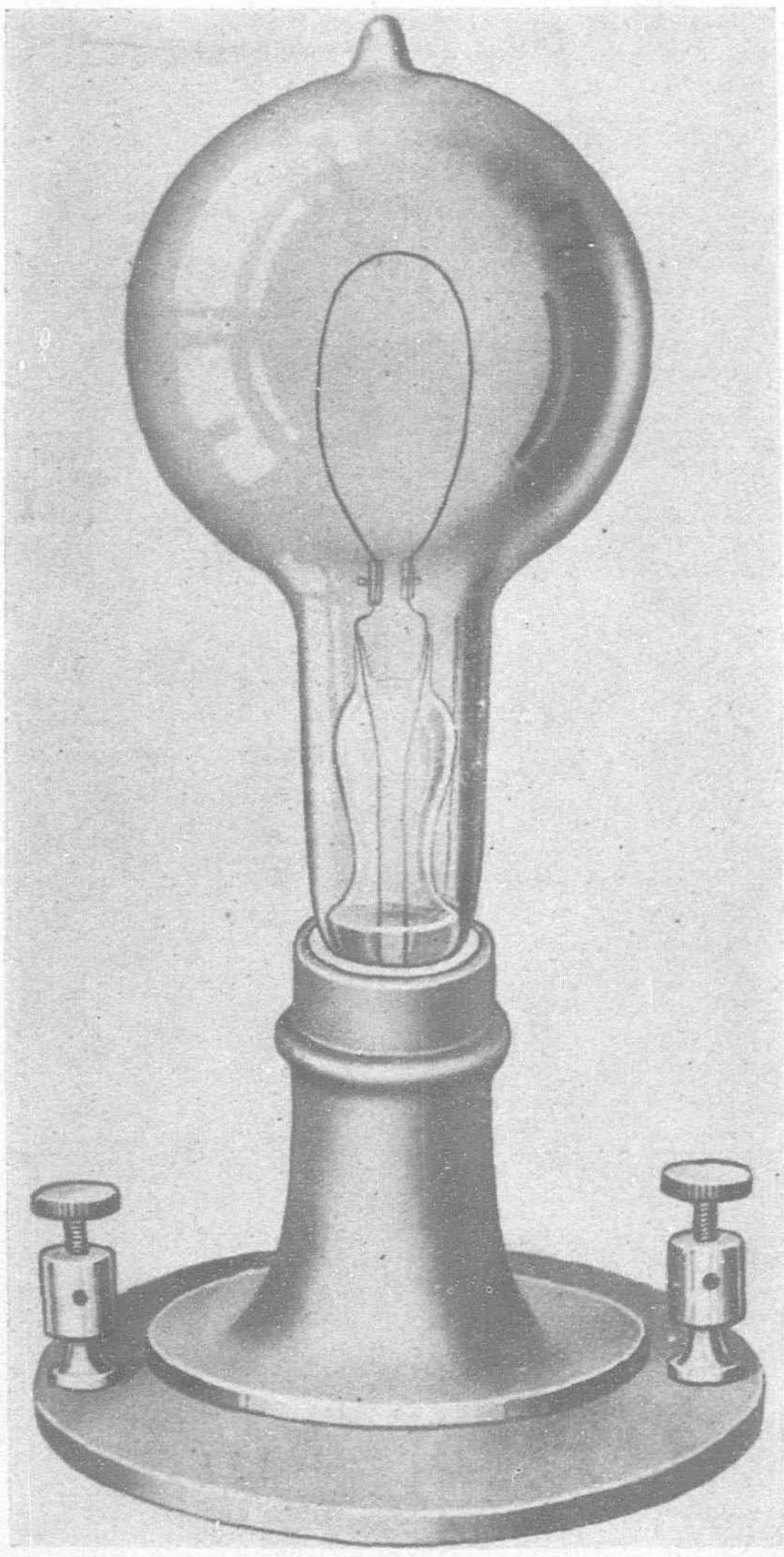
Following his first practical experience as an operator he entered the employ of the Lake Shore & Michigan Southern Railway at Adrian, Michigan, and for the next five years was a "roving knight of the key;" covering the towns of Fort Wayne, Indianapolis, Cincinnati, Memphis, Louisville, Detroit, New Orleans and Boston. An amusing incident happened at Boston. The office saw an uncouth and obviously a product of the West coming into their midst so decided to give him the time of his life. Arrangements were made with the New York operator and Edison was detailed off to take news copy for the "*Boston Herald.*" Starting slowly the operator at the other end gradually quickened his speed, until he had reached his limit of velocity. Obviously nonplussed, Edison continued to receive easily so the New York man commenced which is known as slurring his words. It would have floored any ordinary operator but Edison's experience at Louisville and Detroit abridged the difference between an operator and an expert. Taking copy for some minutes, he checked in and advised the other end, "Young man change off and send with the other foot."

Eventually he landed in New York penniless but full of ambition. It seems the luck of many great men to find themselves without a home and a penny in their pocket, and Edison was no different from the majority. He munched, we believe, tea leaves one time, a hardly appetizing fare considering his New York surroundings.

His first attempt at invention here was a vote recorder for legislative bodies. Washington turned it down, manifesting it would be more injurious than otherwise and would open up an avenue for political deceit. He then set to work and in a short space of time invented a patent stock ticker. He realized $40,000 on this and carried it home in small bills, staying up all night to watch it in fear that it would be stolen. This new encouragement gave impetus and new enthusiasm. He commenced business in the stock ticker line and opened up a shop on Newark, New Jersey, for this purpose. In conjunction with Christopher Shoals he made an improved model of a typewriting machine and produced and sold these likewise. Here also he invented the mimeograph, developed more fully the duplex and quadruplex telegraph system, and invented the electric pen.

After several attempts, however, at partnerships and various enterprises he finally concluded that business and inventions were two entirely different spheres of life so he gave up the former, and in 1876 moved to Menlo Park to follow the vocation of his heart. And here during the summer of his days the real Edison came to life. Prior to this he was known more or less among the scientific American journals as a dilettante or likely man; in Menlo Park he became a national and even a universal figure. From his mind, like the flow of a waterfall, came the phonograph, the incandescent lamp, the storage battery, his "Jumbo Dynamos," electric motograph and many others, all within a comparatively short space of time.

The phonograph was the first of this series and it had for a recording surface a thin sheet of foil. There was no relativity in its appearance with its purpose as a phonograph. Following hard on the invention, Edison rushed to New York and made for the offices of the "*Scientific American.*" Placing the instrument in front of the editor, the inventor requested him to turn the handle on the extreme end of the drum. Completely mystified the editor did so, and it is characterictic of Edison's way of doing things that astonishment is too mild a term for the dumbfounded editor when he heard the machine recite, "Mary had a little lamb." As would be expected, considerable suspicion regarding the authenticity of the machine was quickly abroad, and a minister called the Rev. H. Vincent, originator of the Chautanga movement, believing there was a ventriloquist in the vicinity, strung off a long string of almost unpronouncable biblical names into the trumpet, positive that no other man in the country could repeat them with equal velocity. Needless to state he was convinced.



Replica of Edison's First Incandescent Lamp

"A new light shines" is indeed an appropriate term for Edison's masterpiece, the incandescent lamp. It symbolizes every quality bred in the great inventor; brings to light his breadth of purpose, boundless energy and the vastness of his intellect; and illustrates in concrete form the immeasurable hiatus 'twixt an everyday man and one whose destiny is greatness.

As far back as 1810 Sir Humphrey Davy produced an electric arc from his Royal Institution battery of two thousand cells, and Michael Farraday twenty years later patented the forerunner of the modern dynamo—in the form of a magneto machine. This was the only type of electrical illumination in existence until Edison's lamp of 1870. In 1841, Frederick De Molyns, an Englishman, had dreams and experimented with a metal filament placed in a bulb afterwards evacuated and Starr, an American, was well on the way to promising results had not death visited him at the early age of twenty-five. About 1860, however, a young north country Englishman of seventeen, by name of Swan, afterwards Sir Joseph Swan, commenced experiments, and eighteen years later produced for exhibit at the Newcastle Chemical Society an incandescent lamp on the carbon principle. The exhibit was a failure, though it is interesting to note at this time, that Edison was also experimenting along very similar lines. Entirely unknown to each other and separated by four or five thousand miles of sea, it is remarkable that the train of deduction in the minds of these two men was the same.

Despite these efforts, however, light in this divided form was still a thing of conjecture.

A suggestion made by a friend of Edison's, Professor Parker, gave Edison his first impulse in this new direction. It meant he was to bring forth electric light in small units—the summation of which would constitute the already existing arc—or in other words, produce a lamp with a greater intensity than ordinary gas jets, and comparatively similar in size and commercial ruggedness. This meant sub-division of electricity; a notion considered at the time as being ridiculous. Contemporaneous gas had a big hold it must be remembered, its interests and investments were

tremendous, and there was all the time an anti-Edison movement, or to put it generally an anti-electric lighting campaign, spreading propaganda for the purpose of demoralizing any market which might open its doors to new innovations in this direction. That Edison had a difficult task in front of him goes without saying, and on one occasion he himself stated: "The electric light has caused me the greatest amount of study and has required the most elaborate experiments, although I myself never discouraged or inclined to be hopeless of success. I cannot say the same for all my associates. And yet through all these years of experiment and research I never once made a discovery. All my work was deductive and the results achieved were invention pure and simple. I would construct a theory and work on its lines until I found it untenable, then it would be discarded at once and another one evolved. This way was the only possible way for me to work out the problem—"

In 1877 Edison had tried some experimenting first with carbon strips attached to clamps forming the poles of a battery, then with metals—boron, ruthenium and chromium—inserted between points; he also tried electric candles. His real experiments, nevetheless, did not commence until he moved to Menlo Park. Here a syndicate was formed, capitalized at $300,000, the guiding spirits being Grosvenor P. Lowry, J. P. Morgan and Henry Villiard. A special laboratory was built, library and all complete, with half a dozen or so dwelling houses.

During these early days young men from all parts flocked to Edison's staff. The chief mathematician, Francie R. Upton, was a graduate of Princeton University and later a pupil of Heimann von Hemlholtz. An associate stated of this young man, "Upton could juggle with the integral and differential equations to an extent which would have delighted the heart of any Oxford wrangler." Batchelor, the chief technician, was an Englishman who had come to the States to install thread winding machinery in Clarks Mills in Newark—and stayed. Others were W. S. Anderson, also an Englishman, eventually Consulting Engineer for the General Electric Co., J. W. Lieb, in after years Vice-President of the New York Edison Company and when at Menlo Park was a draughtsman, and Edward J. Nickols prominent some time after as Professor of Physics at Cornell University and the author of several text books. In all there were from forty to fifty men and they worked, according to Edison, "all the time." Each man was allowed from four to five hours sleep each day—no more.

Said Francis Jehl, another well known assistant of the inventor; "It often happened that when Edison had been working up to three or four o'clock he would lie down on one of the laboratory tables and, with nothing but a couple of books for a pillow, go to sleep." He was without doubt gifted in this respect, for after working continuously for twenty-four or thirty-six hours, could snatch some sleep in the manner described by Jehl and wake up refreshed and ready for another day. Once, when near the end of his long trek after the lamp in question, he and some assistants worked without stopping for five days. Only people with great physical endurance and reserve could accomplish a feat like that. Upton, once remarking on this characteristic of Edison, said: "Edison's physical strength was tremendous. All night, the next day and the following night was a common practice with him when interested or nearly approaching a corollary. There was indeed no limit to his stamina." Most of his assistants were young and enthusiastic yet their endurance was a mere powder in comparison with the concrete physical structure of Edison.

But the powers of overwork must eventually be felt, and Edison once in a while would take the entire outfit to the Atlantic for a few days and give them a complete rest. One anecdote of his patience is worth recording here. On one of these holidays he insisted on a fishing expedition and engaged a sloop for the purpose. Once inside Sandy Hook he fished for two days without a bite and only because other members of the party forced him to did he quit by raising anchor and sailing away.

Edison's predominant Idea, as aforesaid, was to have a substance with a small cross section, and the reason for this can be easily understood. The obtaining of incandescents was to be produced by the action of a current passing through a conductor. The resistance of a conductor is inversely proportional to the cross sectional area, therefore his idea was to work with a high resistance and a conductor of small cross section. In the pre-incandescent period his predecessors had worked in the opposite direction, namely, with a large cross section and low resistance. To carry it further the goal in this new phase was to have a voltage high enough to render commercial installation and a conductor to be within the limits of a receptacle about the size of a gas mantle. Accordingly, therefore, to put this idea into practical form meant total reaction on old principles and an altogether new field of endeavor.

Facing such difficulties Edison commenced operations on carbon strips of paper in a variety of forms, coating each element with lamp black and tar for carbonizing purposes. He found that on inserting these said conductors in a globe, oxidation took place. Exhausting apparatus at this time was in its infancy and the vacuum obtained was more or less imperfect. His next efforts were in metals—uridium, platinum, and of refractory alloys; experimenting in atmospheric and vacuo conditions. When incandescent, these metals had longer life but the current required to bring them to this stage was high and had a melting effect. Coiling platinum around a bobbin of refractory oxide was his next experiment—still without results, however. He made in all 1,600 experiments of earths, minerals and ores. A private exhibit was put on at Menlo in the spring of 1879 with a metallic wire filament, current being furnished by a Gramme dynamo. Current was turned on, "a little more juice" said Edison. There was a light like a start and—puff! all was darkness. There were heavy hearts that night at Menlo Park.

Though experimenting with metallic conductors Edison's instinct for success was carbon. The fusing point was 7,000 deg. F. and if he could invent some novel method of counteracting the evaporation of the conductor, success would surely follow.

Many caustic remarks were passed about his efforts in more than one domain of science some polite and some otherwise. Dreamer, fool, boaster, were some of the epithets passed, but he worked on entirely unmoved by prevailing criticisms.

The first essential thing before anything else was accomplished, was to make an efficient air pump. His faith in carbon was profound and if he had the means of obtaining a nearly perfect vacuum, the rest he was sure would be easy. By October 1879 he had designed and manufactured a pump efficient enough to create a vacuum as high as one millionth part of an atmosphere. With success in this direction he turned again to the conductor and experimented with ordinary cotton sewing thread. First, the thread was bent into hairpin shape, placed in a nickel mould and the receptacle inserted in a muffle furnace. After the mould was removed and allowed to cool it was opened and the phantom of thread carefully withdrawn. The next part of the programme was a game of patience and endeavor and was a matter of taking this mere shadow of thread, carrying it some distance to the glass blower's house and mounting it in the bulb. From an entire spool of thread they got three pieces which did not break in the extraction process, working continuously for thirty-six hours. Edison tells the story himself: "With the utmost caution Batchelor took the thread and I marched after him as if guarding a mighty treasure, and to our consternation just as we reached the glass blower's house the wretched thing broke. But we turned back again and before night the carbon was completed and inserted in the lamp. The bulb was exhausted and sealed, the current turned on and the sight which we had so long desired to see met our eyes. The date was October 21, 1879. For forty hours it burned, every man in the laboratory watching amazed and incredulous and only after that period did the light expire. Long enough, however, to show that the little piece of cotton thread had done its work and that a new phase in scientific history had commenced.

Nevertheless, the lamp had little or no commercial value. To manufacture it from an economic standpoint was impossible, so the next step was to find a still more suitable filament which, in addition to manufacture, would stand the hustle and bustle of everyday life. Among the things from which he made tests were bagging, baywood, boxwood, cardboard, cedar shavings, celluloid coconut fibre, drawing paper of various kinds, the red hairs from the beard of his friend Mackenzie, paper saturated with tar, vulcanized fibre and wood splints. He made another workable filament out of tar and lamp black kneaded together. The kneading was a long and tedious process but it "worked," according to himself.

Paoer for a long time was his principal medium, and, though hardly good enough to go into the world, was of a nature fit to be locally applied. Consequently Edison strung these lights around

the environs of his laboratory. People from all parts came to see this new marvel of ingenuity, and if doubting in some cases and credulous in others, they all went away convinced. For months Menlo Park was a sort of Mecca with a pilgrimage of unbelievers.

Scribners Magazine in the February number of 1880 contained an article written by Upton. He said in that precise mathematical manner typical of abstract thinkers, that, " Besides the enormous practical value of the electric light as illuminant and motor, it furnished the most striking illustration of the convertibility of force. Mr. Edison's system of lighting gives a completed cycle of change. The sunlight poured upon the rank vegetation of the carboniferous forests and gathered up and stored, has been waiting through the ages to be converted into light. The latent force accumulated during the primeval days and garnered up in the coal beds is converted after passing in the steam engine through the phases of mechanical, molecular and chemical force into electricity which only awaits the touch of the inventor's genius to flash out into a million domestic suns to illuminate a myriad homes."

Nevertheless, if Edison had found the source of the great quest, the commercial prospects were still as far away as ever.

One day by chance he came across a fan of an Oriental with a handle made of bamboo. He told an assistant to strip the handle into as many filaments as possible and found them far superior to anything yet accomplished. Even then it hardly held the characteristics of the lamp he held in view; so, with that nimbleness of decision forever current in his nature, he decided to procure every available specimen of bamboo though he circumscribed the earth. Then followed the adventurous episodes of fibre hunt. Men were sent to the tropics to comb the vegetation in search of this wonderful plant. Each hunter had a set of implements and were taught to make their own filament, and in this way, India, China, Japan, Malay States, Australasia and Thibet were covered. It was pointed out to Edison that bamboo was the stave which everyone in China leaned on. It furnishes the framework of the Chinese house and thatches the roof over his head, while it supplies paper for his windows, awnings for his shade and blinds for his verandah. His beds, his tables, his chairs, his cupboards, his thousand and one small articles of furniture are made of it. Shavings and shreds of bamboo are the stuffings of pillows and mattresses. The retail dealer's measure, the carpenter's rule, the farmer's waterwheel and irrigating pipes, cages for birds, crickets and other pets, vessels of all kinds from the richly lacquered flower pots of the well-to-do gentleman down to the wretchedest duds and the humblest utensils of the very poor, all come from the same source. The boatman's raft and the pole with which he punts it, his ropes and his sails and the ribs with which they are fastened; the palanquin in which the stately mandarin is borne to his office, the bride to her wedding, the coffin to the grave, the cruel instruments of the executioner, the lazy painted beauty's fan and parasol, the soldier's spear, quiver and arrows, the scribe's pen, the student's book, the artist's brush and the favorite study for his sketch, the musician's flute, mouthorgan, plectrum and a dozen various instruments with still stranger sounds—in the making of these, bamboo is the first necessity. Plaiting and wickerwork of all kinds, from the coarsest baskets to the delicate filigree with which porcelain cups are encased—so cunningly that it would seem as if no fingers less deft than fairies could have woven the dainty web—are a common obvious use of the fibre. The same material made into great hats like inverted baskets, protects the coolie from the sun, while the laborers in the rice fields go about looking like animated haycocks in waterproof coats all made from dried leaves from bamboo. See, at the corner of the street a fortune-teller attracting a crowd around him as he tells the fortune by aid of strips of bamboo graven with mysterious characters and smoking a bamboo pipe. In the cook shop yonder sits the son of Han regaling himself with a mess of bamboo shoots which have been cooked in a vessel of the same material coated with clay and eaten with chopsticks which have come from the same parent stem. Everything is bamboo, it is the transport, the food and the very breath of China—and an adjunct to modern science.

From this marvellous vegetable Edison found his master patent. It was the first lamp ever marketed and from this lamp was the substance from which improvements were made.

The cellulose filament was the improvement of the General Electric Company and was known as the metallized or " Gem" lamp. Since that, with still further promotion, the trade mark " Mazda" came into being and stands for the latest development of the General Electric laboratory and is the last word in lamp science. With the mainspring of the lamp industry commercially applied subsequent improvements followed hard on one another, and in due course, came the tantalum, and later still the tungsten filaments came into being. And so we have the incandescent lamp, a history in the memory of man.

The Jumbo Dynamo

His next experiment was to supply current to light the lamp and he invented the multiple dynamo, known better in these days as the " Jumbo" machine. In addition he designed and made all auxiliaries such as conduits, switches, fuses, connections, service boxes, sockets, etc. During the following year Edison applied for sixty patents, six for dynamos, thirty-two for lamps, and seven for systems. The Edison Electric Illumination Company was formed with a capital of $1,000,000, this company finally emerging into the Edison General Electric capitalized at $12,000,000 in 1889, the premises and works in the first instance at Goerch St. and finally at Schenectady. Everything from the lamp to the minutest cleat was made here and is so even to the present day. Some time later Edison sold out his interests and the company was renamed the General Electric Co. of America. This present company is the largest of its kind in the States to-day, with subsidiary companies the world over; and a direct precedent of the Edisonian inventions. And since these early days, a laboratory staff has been employed for ever probing new discoveries and improving old ones. We believe no less than fifty per cent. of Edison's co-workers eventually landed in this company. It stands, without any doubt, for everything in the world of electricity.

Without permitting himself any relaxation whatsoever after his strenuous attempts at lighting, Edison turned to the motion picture camera. By the summer of 1889 he had made such a machine. He next attacked the magnetic ore separator.

Up to this time the machines in use had an efficiency of less than twenty-five per cent. Edison took up the idea because he knew there was a scarcity of high grade ore and increasing prices. With the aid of a specially constructed needle he located a vast ore deposit in the mountains of New Jersey and set to work to invent a machine which would bring forth a more efficient remuneration than twenty-five per cent. It is said the machine he constructed had a working efficiency of eighty-four per cent, the best ever put on the market. He consequently concentrated on his new strike and was making a fair margin of profit when, sad to relate, a shift of Bessemer ore was discovered in Minnesota, with a simple accessibility and at such a smaller market price, that Edison was forced to liquidate and fall out of the running. Heavily in debt his company paid everything inside of three years. Seventy-five per cent. of the original capital was Edison's own money and he lost "every cent." But " you can't keep a goood man down," and within a month or two Edison was conducting a Portland cement outfit, following which came his storage battery.

In August 1916 Edison was called on to the Admiralty Board in an advisory capacity. Turning over his business affairs to others he put his mind on inventions which might be useful to the United States in case of war. From the time he commenced he produced thirty-nine inventions, some of which are; testing device for detecting submarines, collision mats, scheme for camouflaging and using anthracite coal, cartridge (or small depth bomb) for taking soundings, underwater searchlight, steamship decoy, device for reducing the rolling of warships, turbine head for projectile, Clean shell for blinding submarines and apparatus for smudging enemy periscopes.

Strange as it may seem, many of these inventions were turned down and never even recognized, a contingency which, after his powerful career, is hard to understand. That his practical advice to the Navy Board was of great value cannot, even from any angle, be disputed. Nevertheless, of the list of inventions above named, not one was ever put into practice. They were all tried, found reasonable and were perfect in many cases, yet each and every one was shelved for incomprehensible reasons. Edison himself could never fathom the reason for it himself, although in his usual way forgot about the whole thing and went on with something else.

Of all his great gifts energy was his greatest, and next to this was his logic. Upton, great mathematician and scholar, had never the logic of Edison though Edison in turn had no background of mathematics from which to work. By cold calculation in a

matter-of-fact way Edison would gradually construct a theory which, in the ordinary course of events, would require the application of some rule or formula to follow it. This must not be misunderstood. It is in no way inferred that his genius was great enough to reach corollaries directly without mathematical aid. He employed Upton for that purpose. But it is maintained that his mind had an ultra clarity in comparison with brains which had been cultivated purely on philosophical lines. As a rule a philosopher's mind is a mind of deduction, yet Edison was no philosopher, never claimed to be. It was his boast, if you can call it such, he was no scientist, just a fellow who had been mixed up in many things; nevertheless, he was a powerful reader with a super-observation and with that great quality which many of us lack, an uncommon common sense.

Genius in his own words is "one per cent. inspiration and ninety-nine per cent. perspiration." This is hardly correct but it signifies his modesty and what greater greatness can a great man have than this virtue.

Edison's physical characteristics are a prototype of his mind. He has an unassuming appearance, coupled with a grave and almost dreamy aspect at times. William J. Bishop, in an article quoted in Bryan's work, describes him thus. "The hands are stained with acid and the clothing is of an ordinary ready made order . . . He has the air of the mechanic, or more definitely, with his peculiar pallor, of a night printer. His features are large; the brow well shaped, without unusual developments; the eyes light grey; the nose irregular and the mouth displaying teeth which are also not altogether regular. When he looks up his attention comes back slowly as if it had been a long way off. But it comes back fully and cordially and the expression of his face now that it can be seen is frank and prepossessing. A cheerful smile chases away the grave and somewhat weary look that belongs to it in moments of rest. He seems no longer old. He has almost the air of a big careless schoolboy released from his tasks."

His greatest, or at least, one of the greatest idiocyncrasies which is unusual in men of genius, is his wonderful combination of the abstract and the real. Edison had a perfect unity in his respect and if he followed his ambitions to the end regardless of obstacles he came back periodically to earth for a look around and to consider how these theories looked from a wordly point of view. In his own words, he "was never more than three feet from the surface of the earth at any time."

In many ways he was domesticated and liked, when "off-duty," the solitude of his own home. In that respect he was the everyday man, interested in picture hanging and mending the back door. Married twice, he has lived the life of an ordinary man and been at the same time inside that private doorway of genius which is something to be proud of in both cases.

And now at the age of 82 he is classed among the world's foremost personalities,—a man not only recognized for his numerous inventions, his enterprising initiative and vast intellect, but one whom travelling down the avenue of his long life has consistently worked in the interests of a common humanity. As a rule this latter item is sacrificed, or at least given little consideration, for genius in most cases can never conceive the need of their intellect among the common herd. Their minds are focused on the flimsy piece of texture which is floating in the clouds, to appear in the midst of civilization after they are dead and gone. They never come down to the man in the street, rather does the man in the street rise to the understanding of the genius after long periods of toil and education, for genius is a phase of that humanity as distinct from the ordinary run of life as a mountain peak is to a hilltop and cannot be surveyed in the first glance nor taken in the stride. Stage by stage, if we stay in the vicinity, there gradually comes to us peculiarities of its formation which the first glance never revealed although the entire object was always in view; it stands if we wish to contemplate all the high features in this mountain of intellect and explore all the multitude of corners which are not the lot of the common man, but it takes much patience and what is still more important—time.

To back this up we know from records that the average recognition of a genius is between one hundred and two hundred years—and this applies more so to men of science. Newton's "Principia" and all his auxiliary laws drew upon him during his lifetime more ridicule than anything else. His giant philosophies had to be acquired and were in themselves an offshoot into an entirely new form of education. One hundred and fifty years later they were eventually taken for granted. The constellations of Bayer were laughed at, and such logic from the brains of Flamstead, Halley, Gaus, Humboldt, Thomas Wright and a few others passed by as something concerning the man of to-morrow and the day after. In modern times this has been modified, and if men achieve distinction they are admired even if they are never understood. But Edison is not in this class; he is understood, recognized as a genius and the reason of this comprehension is not that he is in anyway simpler in his applications but because he applies these qualities of genius to the benefit and comfort of his own generation.

Admittedly during Edison's time and within living memory there have been others of equal and even greater scientific brilliancy. thinkers, whom in magnitude of thought and research transcend the great American in many ways. But all in all, taking genius in the broader and deeper sense, namely, its benefit to an immediate society, the existence of a superior is hard to find. Deprive him as you may of the far-seeing powers of a Newton, the deductive sense of a Steinmetz and the mathematical precision of an Einstein, it leaves his greatness undeposable. To-day the incandescent lamp is an acknowledged and accepted fact and part of our daily life, a necessity in our homes and workshops, our factories and hospitals; it stands for cleanliness, physical and mental comfort and inspires to a certain extent an atmosphere of optimism. Some perhaps in a fleeting way can remember the pre-incandescent period of gas and oil and semi-darkness. As Thomas Hardy would say, "A gloaming mixed with midnight." Is not this, then, a form of genius worth while when this semi-darkness and oily smudges are removed and lo! we are in a world of light. More is it in keeping with a magician's wand than in the day's work of a plain American citizen.

And in no less a manner is the business man interested in Edison for his promotion and held in the business world. We can safely say the great inventor has been the indirect means of employing thousands and thousands of men, has improved the economical situation of a vast country and brought happiness and ambition to many a home. To hand we have the moving picture camera, telephone transmitter, electric railway, phonograph, incandescent lamp, storage battery and many others. Each and all constitute new and hitherto unworkable commercial fields. It is estimated that the capital or total investments which are based on the inventions of Edison or which have been materially stimulated by them total $15,599,000,000. Consequently he has been the means whereby vast industries and organizations have come into being, and in passing we can safely say his markets are immense. He has been the Columbus, in other words, of the commerical application of heat, light and sound. And as men we appreciate his manhood, his early trials, his hardships and his keen analytical mind. Plain, honest, with that touch of quakerish simplicity, his will ever be a momory in the minds of come to come.

And such is the purpose of this Jubilee. To pass tribute on this occasion of the fiftieth anniversary of his incandescent lamp and honor him in light. In other words—a Light's Golden Jubilee. This is a great event indeed in its spectacular revelation, majestic coloring and colossal magnificence and worthy of any genius, but little enough in its obligatory form to repay the debt we individually owe this mighty benefactor.

As a last word we might say his inventions have a cosmopolitan significance and are in themselves a trade mark of something more than quality, they represent a goal reached in the furthering of man's odds against nature and an acquisition to the comfort and happiness of mankind.

Political Handbook of the World: Parliaments; Parties and Press as of January 1, 1929. Edited by Malcolm W. Davis and Walter H. Mallory; Published by Yale University Press, New Haven, for Council on Foreign Relations New York.

A very useful reference work is this annual handbook describing the form of government and its personnel in all the countries of the world from Albania to Venezuela. The data can never be exactly current, for political institutions and personalities are constantly changing, but the reader can always make marginal corrections and keep his handbook up-to-date. The list of principal newspapers and press associations is especially useful, for as one reads quotations from newspapers, it is useful to know something of their political complexions. Altogether this is a very useful reference volume.

Peoples' Efforts for Peace and Understanding

Kyoto Conference of Pacific Relations

By KENNOSKE SATO

THE third biennial conference of the Institute of Pacific Relations will be held in Kyoto from October 28 to November 9. Precisely at that time Japan's ancient capital, serene and graceful, will wear her autumnal garb, of crimson maples and garish chrysanthemums. Alone in this antiquated resort, unaffected by industrial vandalism, there lingers the spirit of old Yamato refinement, preserving its nascent simplicity and delicate charm. In choosing Kyoto as the seat of the Pacific Conference, the program committee has shown more than ordinary discretion.

The appointment of Mr. Junnosuke Inouye to be Minister of Finance by Premier Hamaguchi has deprived the Japanese Group of its honored chairman of the Pacific Council. The loss caused by his resignation was keenly felt by the circle, but the consideration of the nation's gain in having a Finance Minister of his caliber at the present critical juncture has promptly caused them to acquiesce. Fortunately, the movement has been largely compensated for the loss by the consent of Dr. Inazo Nitobe to take charge of the vacated office. The new chairman, as a savant and internationalist, enjoys an extensive influence among his people, and is well known abroad as the author of a unique work, "Bushido."

The Japan Council of the Institute has appointed 40 members to participate in the conference in various capacities. The appointment was made with a view to recruiting many able persons from as many varied runs of life as possible. This was deemed particularly advisable in view of the unusually wide field of topics to be discussed by the conference. The greatest difficulty the Council encountered in the choice of delegates was the barrier of language. Ability to command a foreign language and authority in any particular branch of esoteric pursuit are not usually found compatible in Japan. Men whose experienced views would be presented to the conference, to its great benefit, have been found in so many cases unable to express themselves in English. Learned linguists on the other hand revealed themselves as lacking substance to talk upon. Despite, however, the consequent narrowing of the scope of choice, the result attained leaves almost nothing further to be desired.

While academic men, by virtue of intellectual affinity, outnumber any other single vocational group in the delegation, there are represented in it a goodly number of statesmen, business men, financiers, journalists, social workers and so forth. Among some score of professors nominated, there are included men like Dr. Anesaki of Tokyo Imperial University, a reputed scholar in Oriental religions and civilization and Dr. Sakuzo Yoshino of the same institute whose championship of the cause of democracy has greatly contributed to extension of popular rights in Japan. Among financiers, the names of Mr. Sobun Yamamuro, the director of the Mitsubishi Bank and Mr. Masasuke Odagiri, the Managing Director of Yokohama Specie Bank stand pre-eminent. The inclusion of men like Mr. Shunsaburo Komura, a sympathetic scholar of China and Mr. Yosuke Matsuoka, former Vice-President of South Manchuria Railway, is encouraging inasmuch as Chinese questions are destined to occupy an important position in the Conference's procedure. The appointment of Baron Sakatani and Count Soejima, both members of the House of Peers and alike distinguished internationalists, add some prestige to the Japanese delegation. But perhaps the most dramatic figures in the party will be Mr. Bunji Suzuki, Japan's veteran labor leader and a Parliamentary spokesman of the Propetariat, and Mr. Jotaro Kawakami, a radical socialist member of the Imperial Diet. Although the number is by far too small, the nomination of two ladies—Miss Aiko Hoshino, acting president of Tsuda Girls College and Miss Tetsuko Yasui, president of Women's Christian College in Tokyo—has been acclaimed as very gallant of the Council members.

The Americans have been displaying perhaps the greatest enthusiasm toward the Kyoto Conference. The American Council gave a luncheon in Hotel Ritz-Carlton, New York City, on July 16, and on that occasion its chairman, Mr. Jerome D. Greene, announced the names of people appointed members of the American Delegation, 40 in all. Following the admirable principle of the equality of opportunities between both sexes, the delegation is made up of almost equal numbers of men and women with a generous sprinkling of names that enjoy national, and in some cases international, reputations. To mention only some more distinguished names, there are Mrs. Ethel R. Allen, of the Department of Education in California State; Mr. Sewell L. Avery, President of the U.S. Gypsum Company of Chicago; Mr. Charles R. Bennett, manager of National City Bank of Peping, China; Miss Ada L. Comstock, President of Radcliff College; Mr. Jerome D. Greene, of Lee, Higginson and Company of New York City; Professor William H. Kilpatrick of Columbia Teachers' College; Mr. James G. MacDonald, chairman of the Foreign Policy Association of New York; President Leighton Stuart of Yenching University, Peping, China. Mr. John D. Rockefeller 3rd, the eldest son of Mr. John D. Rockefeller, Jr. will act as one of the assistant secretaries of the delegation. Professor James T. Shotwell of Columbia, celebrated author of the American draft of the Anti-War Pact, has already arrived in Japan with his family; he will act as chairman of the International Research Committee of the Institute.

Canada has also turned in the names of persons appointed members of her delegation. There are on the list of some 20 names such familiar ones as Sir John Aird, President of the Canadian Bank of Commerce; Colonel C. S. MacInnes of Toronto and Mr. H. R. McMillan of Vancouver. While Great Britain, China, Australia, New Zealand, Netherlands, France and Soviet Russia have not yet turned in the names of their respective delegation, there is no doubt that the national group in each of these countries is busying with the appointment of suitable persons as representatives.

One reason why the coming Kyoto Conference is looked forward to with so much enthusiasm may be sought in the timeliness and weightiness of questions proposed for candid discussion. The Conference has been challenged with the task of wrestling with six groups of problems, each one of which may undergo endless subdivisions. First in the order is the question of food, population and land utilization. As is well known, the eastern border of the Pacific is inhabited by races singularly prolific not, however, exactly addicted to desire for exercising voluntary check upon the process of their multiplication. While the population has steadily augmented, the amount of land controlled has not undergone any change. Up until the point of diminishing return was reached it did pay to put a greater amount of labor in the limited land surface, but after that dead line was reached agriculture ceased to be a profitable enterprise. The sequel of discrepancy between increasing number of souls and diminishing quantity of food has been the frequent menace of famine, and increased dependence for group existence upon the supply of food from abroad. Emigration would help relax the congestion, but the dwellers in this part of the Pacific have been denied entrance as immigrants to most of the colonizing countries. What ought to be done under the perplexing circumstances? Such in short is the interpretation of the problem as conceived by men who have originally proposed it.

Already application have been made by a number of distinguished men to read papers purported to help solve the portentous difficulty. Mr. C. C. Chang proposes to read a paper on "The Extent of Land Utilization in China;" Mr. C. H. Chen promises to present his thesis on "China's Population Problem." From the Japanese side Professor S. Nasu will read a paper on "Population and Food Supply in Japan;" and, representing Russia, Mr.

A. Petroff will offer his essay on "Migration of Russians from West to the Far East." No small amount of interest is being attached to the work, "The Peopling of Australia" which Mr. G. L. Wood and Mr. P. D. Phillips, the joint authors, propose to read and analyze for the Conference. Mr. G. H. Scholefied's paper on "Studies in New Zealand Affairs" also promises to be of great interest.

Second time on the schedule is the situation in Manchuria, with special reference to some momentous questions in present-day China. Manchuria, so to say, is a hotbed of diplomatic complications in the Far East, partly on account of historical implications, and partly owing to peculiar economic advantages which go with its political control. While China is an uncontested owner of the territory, Japan has come to regard it, not wholly without good excuse, as the source of her national welfare, indeed of subsistence. Russia too has a large economic stake in the region and will not easily surrender her prerogatives to the Chinese. The recent outbreak of a conflict between the Chinese and the Russians on the Chinese Eastern Railway has exemplified the acuteness of some aspects of international relations abstrusively fermenting lately in that part of Asia. The situation has been further complicated by the claims of other Powers to enjoy equal opportunity there, not in name but in substance, and by surreptitious attempt on the part of those which have precedence at forestalling their encroachment. In taking up this decidedly delicate question, the Pacific Institute prudently hopes to avoid stirring the hornet's nest, by confining its task for the time to acquainting itself with the situation as it actually prevails. In conjunction with Manchuria, such questions as tariff autonomy, extraterritoriality, and restitution of concessions in China will also receive serious consideration in the Conference. To mention a few of the more significant papers announced under this category, there are "Russian Influence in China" by Mr. M. J. Bau; "Japanese Emigration to Manchuria" by Mr. Ta Chen; "Studies in the Recent Diplomatic History of Manchuria" by Mr. Shuhsi Hsu; and "Japanese Interests in Manchuria" by Professor M. Royama.

The third topic group to be dealt with is industrialization of Asiatic countries and the status of foreign investment. Under this topic the conference expects to study the extent of industrialization going on in Asiatic countries, which have hitherto been identified as agricultural, and its economic, social and political consequences. The steady growth of native industries inevitably causes a change in the status of foreign trade and eventually in the status of customs tariff. To investigate facts and formulate tangible opinions as to the harmonious manner of adjusting conflicts arising out of trade and tariff relations, is thus one object of the Conference under this heading. As to the exceedingly complex question of foreign investments, great as the need for regulation, the Institute does not consider it practical at the present to go any further than making a survey of the actual situation. Notable papers announced under this general topic are: Mr. T. E. Gregory's "British Investments in China;" Mr. D. K. Lieu's "The Chinese Cotton Industry" and "Foreign Investment in China;" Mr. T. M. Liu's "China's National Tariff;" and Japan Council's "Japanese Investments in China."

Diplomatic relations in the Pacific is the fourth general topic of the Conference. Professor Shotwell of Columbia will assume leadership in the discussion of various questions falling in this category, which will center around the bearing of the Paris Pact on affairs of the Pacific. He seems to be of the opinion that the Anti-War Pact as it stands lacks the necessary implement for its enforcement, as far as those nations which are not signatories to the League of Nations are concerned. He thinks, however, that it is fortunate that there is the Four Powers Treaty of Washington, which may be improved as a sort of instrument for enforcement of the Paris Pact among the Pacific nations. He accordingly hopes to propound his ideas in the conference as to how the foregoing two treaties may be correlated for practical diplomatic purposes. He is announced to read two important papers: "Diplomatic Machinery in the Pacific" and "War as an Instrument of National Policy." The League of Nations Secretariat has submitted "A Memorandum on the League's Activities in the Pacific"—a rather contribution on the question.

The fifth topic is the problem of how to obtain fuller and further interchange of news in the Pacific region. The influence of the press upon the conduct of nations and upon the manner of their association has been steadily on the increase, and the recognition of this fact has induced the Institute to take up the question. The sixth and the last topic is cultural relations. The topic is quite comprehensive and has been provided for in order to afford opportunity for delegates to exchange their opinions frankly on any topic conducive to the promotion of mutual understanding and goodwill among the nations represented. Various interesting papers are promised under this divisiom, such, for instance, as Mr. Hu Shih's monograph on "Cultural Relations of East and West;" Mr. Romanzo Adams' "Further Developments in Race Contacts in Hawaii;" and the Japanese Council's Symposium on "Cultural Influences."

As may be inferred from the foregoing brief description of the program, the Kyoto Conference of the Pacific Institute promises to be an event of unusual interest and importance. It is interesting because it is a meeting of different races with different cultures, assembled to co-ordinate their unique ideals and experiences, so rich in variety and content. It is important because it is the first systematic attempt, at least in the Pacific region, at founding a permanent institution of 'peoples' diplomacy destined ere long to play a decisive rôle in the making of the Pacific Era. With keen realization of the honor conferred upon Japan in naming Kyoto as the Conference's seat, the Japanese are making every possible preparation to make the event a success. The two best hotels in that quiet city,—Miyako Hotel and Kyoto Hotel—have already been instructed in the manner to receive the guests; and a program of delightful social functions and sightseeing has been made by a special committee. Every indication points to the eventuality that the delegates are going to have a mighty jolly time in Nippon.

Extraterritoriality

(Continued from page 388).

And, if the American Government, realizing that the Turkish people's legitimate aspirations, under the guidance of the new and strong government, could accomplish great things in a short space of time, had the wisdom and foresight to relinquish special privileges similar to those enjoyed hitherto by its nationals in China and has had the satisfaction to find that the life and property of American citizens in Turkey has subsequently received full and adequate protection; the American Government which, in full justice to the Turkish people, relinquished those rights without any apprehension, will no doubt solve the problem of extraterritoriality in China in the same friendly and sympathetic spirit.

It has been perhaps brought to the knowledge of the American Government that the Chinese Government has recently concluded treaties with several other Powers which have agreed to relinquish extraterritorial privileges on January 1, 1930.

If it has appeared to the Government of those Powers, as it appears to the American Government, that there does not yet exist in this country a judiciary capable of rendering justice to their nationals and a body of laws adequate to give protection to the life and property of their nationals they would certainly have refused to give up their privileges of protection and enter into the agreement they have made.

Now that many of the Powers which participated in the discussion of extraterritoriality at the Washington Conference have already resolved, by an overt act, that that system has outlived its usefulness and should be replaced by one in harmony with the actual state of nations, there is no reason why the United States, upon whichf ell the honor to initiate the labors of that conference, should not act in unison with those Powers, thus removing the difficulty which the Chinese Government might otherwise encounter in extending jurisdiction to all foreign nationals.

It is the hope of the Chinese Government that what conditions and apprehensions the American Government may have in considering the subject under discussion will be now dispersed and that, in a proper examination of this subject in all its aspects it will be absolutely actuated by a much wider consideration; namely, a unanimous friendship between the Chinese and the American people, and hence the promotion of the material interests of both.

It is with this object in view that the Chinese Government now requests the American Government to enter into immediate discussions with the authorized representatives of the Chinese Government for mzking the necessary arrangements whereby extraterritoriality in China will be abolished, to the mutual satisfaction of both Governments.

I avail myself of this opportunity to renew to Your Excellency the assurance of my highest consideration.

(Sgd.) CHENGTING T. WANG.

His Excellency,

J. V. A. MACMURRAY,

Envoy Extraordinary and Minister Plenipotentiary of the United States of America to China.—Reuter's Pacific Service.

Some Thoughts Concerning Economics in the Development of China

X.—Sanitation and Potable Water for China

By COL. ARTHUR M. SHAW and Dr. J. A. L. WADDELL

[Previous Articles in this Series have appeared in the "Far Eastern Review"]

THE following remarks are intended to apply only to the hamlets, the towns and the smaller cities of the Chinese Republic, because in the large cities thereof there should undoubtedly be installed as soon as possible modern systems of water supply and sewerage, based upon the most approved American and European engineering practice.

To all thinking persons in China, whether they be foreigners familiar with the conditions abroad, Chinese who have travelled in other lands, or intellectual natives who have remained in thiscountry but are desirous of forwarding China's welfare, it has long been apparent that a radical improvement of sanitary conditions throughout the land must be made if the health of the people is to be properly conserved.

In some of the middle-class and smaller cities, however, even the leading citizens have not yet begun to realize the potential danger to health which lurks in the drinking water and the household wastes. For this reason, it is probable that an active campaign of education should be made as the first step towards improving the unsatisfactory conditions. The people must be made to understand that their present facilities are both undesirable and dangerous; otherwise their co-operation in a campaign of betterment cannot be secured.

It has been demonstrated time after time throughout the world that improved methods of living cannot be forced on a people who do not realize the benefits that might be derived therefrom, as witness, for a general example, the case of Prohibition in the U.S.A. A minor specific example occurred a few years ago in New York city, where a millionaire philanthropist built a "Model Tenement." The families that were moved into it from the slums found that the beautiful white bath-tubs with which their new quarters were furnished served excellently as containers of the family supply of coal.

The remedy which occurs to a foreign engineer, when he first observes conditions in an un-sewered city of China, is that a sewer system should be constructed at once; and that this system should follow, in a general way, the systems now in use in his own country. This would include the discharge of the raw sewage into the most convenient stream, if the amount of water flowing therein be sufficient for safe dilution, or, if not, then the installation of a septic tank, or Imhoff tank, or some other of the modern devices employed in the reduction of harmful bacilli.

Even the casual student of Chinese conditions will immediately recognize two fatal defects in such a plan, namely, the universal lack of an adequate public water supply, and the compelling necessity for conservation of all available materials for restoring to the soil those elements of which it has been robbed during centuries of cultivation.

Excepting only in the arid and semi-arid regions, it is probable that every town and city in China can be furnished with a public supply of drinking water of infinitely better quality than is now available, and at a cost that will not be prohibitive. All the people of China are entitled to have as much good water for drinking and bathing as they actually need; and it can generally be obtained by means of artesian or driven wells. Frequently a supply of pure water can be secured at a reasonable depth below the surface of the ground—far enough, however, to ensure its being free from contamination. This could be delivered either to public hydrants or to residences—in many cases to both, a charge being made for special delivery, but the supply from the hydrants being free for everybody, subject to suitable regulations to prevent waste. In communities of any size, the cost of these driven wells should be borne by the inhabitants thereof; but in villages where the people are poor the said cost should be assumed by the Provincial Government. In case a supply of artesian water cannot be found at a reasonable depth, it would be necessary to utilize surface water from a near-by stream, of course after proper purification, because it is almost impossible to find in the streams of China, at places where water is needed for drinking, a supply sufficiently pure.

Under the present financial conditions of this country it would not be feasible to provide, as in America, all the water needed for domestic purposes, street washing, garden irrigation, etc., but a reasonable expenditure of money should suffice for drinking and personal ablution purposes only.

While water carriage may be the cheapest means available for the transportation of sewage, and while it has the advantages of convenience and freedom from objectionable odors, it is certainly not the best system for adoption in China. The question of sewage disposal is a complex one, even in Western countries; but the complexities are so multipiled in China as to render it worthy of the best engineering talent of the country. Foreign engineers can be of some assistance in the study of certain phases of the problem, but they cannot bring to its solution a past experience with identical conditions. Sewerage works have been in use in other localities, however, that may indicate lines of investigation which can be followed with profit.

For instance, the entire sewer system of the city of San Antonio, Texas, is discharged into a shallow depression, creating an artificial pond, known as Mitchell's Lake. The sewage is drawn from this lake, under contract, by private individuals, who sell it for the combined purposes of irrigation and fertilization. The system has two serious disadvantages—first, the stench from the lake is an abomination, and, second, the pool forms an ideal breeding ground for the anophiles mosquito. These insects used to exist there in immense swarms, and the malaria they carried poisoned all the near-by population, until that eminent scientist and bacteriologist, Dr. Charles A. R. Campbell, a practising physician of San Antonio, after many years of study, experimenting at his own expense, and hard personal work, managed to keep down the hordes of insects by the propagation of their natural enemy, the bat, in a house specially designed for the accommodation of those little animals. The history of his most interesting experiments is given in a book of his, entitled "Bats, Mosquitoes, and Dollars."

Again, in Italy a "Digesting Cell" has been developed as a result of the studies of Dr. Guisepe Becari, which may serve as the basis of a scheme of sewage disposal for cities and towns in China. It was described in some detail in a report of "Engineering Foundation," entitled "Humus from Garbage—Inoffensive Waste Disposal." From that paper the following excerpt has been made:

"For generations, men have sought to return to the soil some of the nutriment taken from it. In the main, man's organic wastes have been lost, especially from communities. Indeed, they have been a nuisance or a menace unless destroyed. Often they have been removed long distances only to pollute streams, harbors, or idle land. Science and engineering have offered many methods for disposal of sewage, garbage and other wastes. One of the problems has been to devise simple, inexpensive, and safe means suitable for small communities, institutions or single families, yielding an inoffensive and useful product. High cost of feritilizers, caused by the war, gave new impetus to endeavors in some European countries.

"A few years ago, an Italian scientist, who had worked on the problem for a long time, Giuseppe Beccari, discovered that in a properly constructed cell of cement concrete of other tight masonry, natural processes of fermentation could be so controlled and expedited as to reduce kitchen waste, animal carcasses, grass clippings, fallen leaves, stable manure, and human fecal matter to humus without disagreeable odors or other offensive features. No fuel nor chemical is required. Aerobic bacteria do the work. All disease germs of man, beast and plant, all weed-seeds and

parasites are destroyed. Gustavo Gasparini and other scientists have confirmed by extensive tests the results gotten by Dr. Beccari. The zymothermic cells are in practical use in a number of places in Italy.

"After a cell has been filled, the temperature begins to rise on the third day, and in a comparatively brief time attains 140 to 150 degrees Fahrenheit. Maximum temperature, between 150 and 160 degrees, is reached about the tenth day, holds nearly constant for 20 days, and then falls slowly. Fermentation is complete in from 35 to 45 days, depending on atmospheric conditions and the nature of the wastes. By the 35th to the 45th day the product is sufficiently cooled to be drawn out to a bin in front of the cell, or other convenient place, where, exposed to sunlight, the excess moisture dries out. The product then resembles loam. Bones, objects of metal and ceramic wares are not affected; they are removed by screening. Of course, it were better to keep them out of the garbage in the beginning, particularly tin cans and broken crockery. Carcasses of animals are reduced to skeletons (entirely free from flesh and cartilage) and a small humid mass. At no time during the process is there odor of putrid flesh.

"The inoffensive black humus yielded by the cells may be used as an enricher of the soil, restoring some of the properties taken out by crops. It is a good fertilizer, containing nitrogen, phosphate and potash.

"Each cell is an approximately cubical masonry box of from one to 25 cubic yards capacity, according to requirements of each installation. Larger plants are made by grouping cells in series. Each cell has a double floor, the lower one watertight and the upper a concrete grating. Through the outer wall, between the two floors, are air inlets. In the four interior corners are vertical air ducts with openings at regular intervals connected with horizontal air passages formed by ridges on each wall, projecting a few inches. All these airways, and the space at the top of the cell, over the charge of wastes, connect with a specially-constructed ventilation-tower surmounting the cell and having openings to the atmosphere. Wastes are put in through an opening in the top of the cell. The product is removed through a large opening in the front wall controlled by a tight door. The liquor from the charge during fomentation is collected by drains from the lower floor into a pit. This liquor contains many of the bacteria of fermentation and is used for wetting new charges, so as to assure and expedite the beginning of the process. The exact form and arrangement of the cell was determined by years of experimentation.

"Although an outgrowth of the compost heap, common in gardens for centuries, the zymothermic cell is a product of scientific research and engineering design. Success appears to be due in large measure to the arrangement of air passages which distribute air to all parts of the contents of the cell."

This Italian method should prove serviceable in China, provided that the fertilizing capacity of the treated refuse is not much less than that of the untreated ingredients—a question that would have to be settled in this country by actual testing.

It appears to the writers of this memoir that the Italian plan promises more, as a clue to the ultimate solution of the problem, than does that of the Texas city, although, in arid or semi-arid sections, the latter scheme may be found to suit the local conditions.

In any event, the demands of cleanliness, modern life (with its objection to offensive odors), health, and agriculture are too insistent to be ignored, and must each be duly considered by any engineer who attempts to solve the complicated problem of sanitation for China. It involves also questions of Physics, Bacteriology and Political Economy. Advice and co-operation from the highest available authorities in each of these lines of science should be sought by the engineer who may attempt to find a solution of the problem. To such an engineer, if successful, will be due the honor and gratitude of China, and of humanity in general. Aside from the idea of financial gain, it would seem that this incentive should be sufficient to spur some of the brightest engineers of the Republic to an interest in the subject that will result in giving to its people this means of increasing the productivity of the land, prolonging life, and reducing human suffering brought about by diseases, the germs of which now are carried from exposed human wastes to the family food.

To evoke a realization of the importance of protection against flies, it might be well to refer to the experience of one of the authors in a large American city where household waste (excepting sewage) was disposed of at a garbage dump, some of these dumping places being on vacant lots or in abandoned canals within the built-up portions of the city. The writer was connected with the local "Child Welfare Association" and later served as Chairman of the "Health and Sanitation Committee" of the Association of Commerce, and, while occupying those positions, became convinced that the garbage dumps had become foci of disease, especially among children. From the archives of the City Health Bureau a record was secured of the deaths of children during an entire year in each block of the city. On a general map a black dot was placed in the individual block where the death of a child had occurred during the year. This map showed a most alarming grouping of the black dots in the immediate vicinity of the garbage dumps, with only infrequent dots in the more remote blocks, and many such blocks with no record of the death of a child. The city records showed that a large proportion of these deaths in the vicinity of the garbage dumps were the result of intestinal infection of the type the germs causing which are usually carried by the ordinary house fly. These were present in great swarms, both at the garbage dumps and for several blocks distant therefrom.

While garbage dumps are a source of great danger in a community, the germs which may cause disease if taken into the digestive system are not nearly so plentiful in such waste material as they are in the wastes of the human body; and, for this reason, especial care must be taken to keep flies and other disease-carrying insects from such wastes and thus safeguard the food of the people.

Another important preventive measure is the control of sanitation in the preparation of food. Not only must flies be kept away from it, but dishes, utensils, and the hands of the servants who prepare the meals must be free from any possible germs.

Meanwhile, it is entirely practicable to improve materially living conditions of the poorer classes of the Chinese, simply by insisting, through the power of the law and the influence of education and persuasion, upon their keeping their streets, their houses, and their immediate surroundings comparatively clean. The conditions under which they live are utterly appalling! Modern sewage should be immediately installed. Means to purify drinking water should be devised and put into practice at once. Methods to eliminate flies and mosquitoes should claim the first attention of not only the immediate authorities, but the higher political authorities as well. It is only by the application of such means that the life of the poorer classes can be elevated and infant mortality reduced to the minimum.

A proper comprehension of these awful evils ought so to impress the municipal and rural authorities as to impel them to take action towards the amelioration of a large portion of the dire effects that always result from the infraction of the fundamental principles of ordinary sanitation.

China's Internal Loan Obligations

An Analysis and Statistical Research

By E. KANN

ON September 1, 1929, the Chinese Government owed to its own people $500,000,000. This amount has been loaned within the country against bonds and Treasury notes, all of which have been issued by the Ministry of Finance, formerly at Peking, now at Nanking. The total does not include the Second Disbandment Loan at present under contemplation and discussion, amounting to $70,000,000. Neither does it take account of the numerous short-term debts incurred by the

Board of Communications, or by the Minister of War, especially under the old *régime*. The half-billion dollar debt also does not include provincial and municipal loans, old and new.

China's Internal Loans are uniform in one respect only, inasmuch as they have all been issued in the national silver dollar and that consequently interest and capital redemption is repayable in the same currency. It is noteworthy that, while there have been many defaults in the redemption of Peking's loan issues, there has been no delay so far in the service of the loans issued by the National Government at Nanking.

Itemized as to their origin and nature the Internal Debts of China, on September 1, 1929, present the following picture :

	Total outstanding	Percentage of total	Of which overdue
Issued by Peping Admin	$207,077,926	40%	$92,666,256
„ „ Nanking Admin	289,829,055	58%	—
Local issues under Nanking's authority	8,500,000	2%	—
Grand total	$505,406,981		

Peping issues in arrears : As will be seen $92,666,256 issued by Peking are now in arrears, as per particulars below. Interest have, however, been regularly met hitherto, with the exception of the 96 million dollar loan, and recently also as regards the interest on the 11th Year Treasury Notes against salt surplus, the Famine Relief Loan of 1920, the 2nd series of 6% Consolidated Loan and the 2nd series of 7% Consolidated Loan.

On September 1, 1929, the following sums relating to Peking's internal loan issues, were overdue :

		Last payment rendered.
6% Consolidated Loan	$22,844,736	December 1, 1925
7% „ „	6,120,000	August 31, 1926
96 million Dollar Loan...	56,391,300	none
Salt Surplus Treasury Notes	3,500,000	April 20, 1923
Spring Festival Treasury Notes ...	2,200,000	none
Famine Relief Loan of 1920	1,610,220	July 31, 1922
	$92,666,256	

As a matter of fact, some of the above loans (namely first and second) are secured on the Consolidated National Loans Sinking Fund, and yet they are being allowed to go to default.

The history of the Consolidated National Loans Sinking Fund, dating only from 1921, is a rather varied one. Briefly stated this fund was originally composed of $10,000,000 per year to be contributed from the wine and tobacco tax, plus $14,000,000 a yearly contribution from the salt surplus. Provision was made that, in the event of the former proving insufficient, the railways of the country should contribute $6,000,000 annually toward the fund, which was designated to provide for interest and capital redemption of certain loans then outstanding, of which the two aforementioned obligations represent what is outstanding to-day. This arrangement worked most unsatisfactorily, the wine and tobacco bureau contributing nothing, while the other sources began to act, without, however, persevering in their duty.

The Inspector General of Customs, acting as supervisor of the Consolidated Loan Service proposed therefore (in August, 1922) to apply the customs surplus to the loan service, drawing on the Salt Gabelle (up to $14,000,000 per annum) only, if the customs surplus should not suffice. By Presidential Mandate of September 19, 1923, the surplus from the customs revenue was definitely pledged for the Consolidated National Loan Service.

The position of the said service to-day, both as regards redemption of capital overdue on date, and also falling due during the remainder of 1929, as well as the interest service during the entire year of 1929, is as follows :

	Capital	Interest due for 1929
6% Consolid. National Loan, overdue	$22,844,736	$2,349,744
6% „ „ , due 1929	8,158,835	—
7% „ „ , overdue	6,120,000	571,200
Spring Festival Notes overdue	2,200,000	640,000
6% Seventh year Long Term Loan	—	2,362,500
	$39,323,571	$5,923,444

It will thus be seen that the Consolidated Loans Sinking Fund would have to supply altogether $45,247,015 during 1929, against an income of a sum which might reach $24,000,000, but which might be less than this amount.

Security for loans : The following table indicates the sources of income which is meant to provide the security for China's Internal Loans. In referring to the "Customs Revenue" we mean to include the revenue derived from the recent increase in the country's customs tariff which, considered in this light, is to be differentiated from the "Customs Surplus."

Security	Peking issues	Nanking issues	Total	Percentage of total
Customs Revenue ...	$55,854,000	$210,229,055	$266,083,055	52%
„ Surplus ...	55,322,406	45,000,000	100,322,406	20%
Salt Surplus	59,891,300	—	59,891,300	11%
Tobacco Tax	—	29,100,000	29,100,000	6%
Stamp Tax	—	9,500,000	9,500,000	2%
Municipal Revenues ...	—	4,500,000	4,500,000	1%
Not definitely secured ...	36,010,220	—	36,010,220	8%
Grand total	$207,077,926	$298,329,055	$505,406,981	100%

The application of security to the individual loans can be tabulated in the following manner :

1.—Effective 5% Customs Duty (Customs Revenue Proper) :

		Original amount issued.
Seventh Year Long Term Loan	(1918)...	$45,000,000
6% Consolidated National Loan	(1921)...	54,392,228
7% „ „ „	(„)...	13,600,000
Twelfth Year Treasury Bonds	(1923)...	5,000,000
Thirteenth Year Treasury Bonds	(1924)...	1,000,000
Fourteenth Year 8% Bonds	(1925)...	15,000,000
Seventeenth Year Short Term Loan	(1928)...	30,000,000
Treasury Bonds Secured on Austrian Cancelled Indemnity	(1926)...	2,400,000

2.—Customs Revenue Collected in Excess of the 5% Duty :

2½% Surtax Treasury Bonds, 1st issue	(1927)...	$30,000,000
2½% „ „ „ 2nd „	(„)...	40,000,000
2½% „ „ „ Tientsin	(1928)...	9,000,000
Spring Festival Treasury Bills	(1926)...	8,000,000
17th Year 2½% Long Term Bonds	(1928)...	45,000,000
18th „ Famine Relief Treasury Bonds	(1929)...	10,000,000
18th „ Troop Disbandment loan	(1929)...	50,000,000
Rehabilitation Short Term Bonds	(1928)...	40,000,000
18th Year Customs Surplus Bonds	(1929)...	40,000,000

3.—Tobacco Tax :

Treasury Bonds Secured on Rolled Tobacco Tax	(1928)...	$16,000,000
„ „ „ „	(1929)...	24,000,000

4.—Stamp Tax :

Military Treasury Bonds	(1928)...	$10,000,000

5.—Salt Surplus :

96 Million Dollar Loan	(1922)...	$56,391,300
11th Year Special Salt Surplus Treasury Bonds	(1922)...	14,000,000

6.—Unsecured :

7% Famine Relief Loan	(1920)...	$ 2,000,000
6% Consolidated Loan (2nd series)	(1921)...	25,600,000
7% „ „ („ „)	(1921)...	8,800,000

Between May, 1927, and August, 1929 (28 months), the Nanking Administration has issued (apart from local loans) altogether $344,000,000 in the shape of Internal Loans. Of these $54,170,945 has so far been redeemed. Taking China's population at about 430 million people, we obtain a *per capita* debt of $1.20, as far as it relates to this country's internal debts outstanding on September 1, 1929.

Period of Reimbursement.

The following table indicates the annual obligation, as far as redemption of capital is concerned, of China's Internal Loans, Repayment is scheduled to take place in the following manner :

	Peking	Nanking	Total issues
Overdue	$92,666,256	—	$92,666,256
1929 (Sept.-Dec.) ...	12,404,834	$17,666,392	30,071,226
1930...	20,694,836	52,910,498	73,605,334
1931...	16,100,000	49,625,127	65,725,127
1932...	15,268,000	43,011,674	58,279,674
1933...	13,768,000	30,754,671	44,522,671
1934...	14,716,000	21,510,693	36,226,693
1935...	11,764,000	15,950,000	27,714,000
1936...	4,932,000	10,250,000	15,182,000
1937...	4,764,000	9,950,000	14,714,000
1938...	—	9,950,000	9,950,000
1939...	—	5,250,000	5,250,000
1940—1953... ...	—	31,500,000	31,500,000
	$207,077,926	$298,329,055	$505,406,981

LIST OF CHINESE INTERNAL LOAN ISSUES OUTSTANDING ON SEPTEMBER 1, 1929

Peking Administration: *Compiled by* E. KANN and J. BAYLIN

Name of Loan	Issued in	Amount authorised	Amount issued	Outstanding Sept. 1, 1929	Rate %	Interest payable	Secured by	Denominations	Issue price	Repayment and general remarks
**7th Year Long Term Loan of the Republic of China	1918	$45,000,000	$45,000,000	$38,250,000	6	June 30 Dec. 31	Capital on Russian Boxer Indemnity. Interest on Consolid. Nat. Loan Service	$10,000, $1,000 $100, $10	100	Between June, 1928 and December, 1937, $2,250,000 half-yearly.
*Chinese Government 6% Consolidated National Loan	1921	$54,392,228	$54,392,228	$39,162,406	6	June 1 Dec. 1	Consolidated National Loans Sinking Fund	$10,000, $1,000 $100, $10, $1	100*	Between December, 1921 and December, 1930, 1921-1924 $2,719,611 yearly 1925 $4,351,378 1926 $6,527,066 1927-1930 $8,158,835 ,, Three drawings in arrear.
Ditto, 2nd series	1921	$25,600,000	$25,600,000	$25,600,000	6	Jan. 1 July 1	Not definitely secured	$10,000, $1,000 $100	100*	Between 1931 and 1935 by five drawings.
Chinese Government 7% Consolidated National Loan	1921	$13,600,000	$13,600,000	$ 8,160,000	7	Feb. 28 Aug. 31	Consolidated National Loans Sinking Fund	$1,000, $100, $10, $5, $1	100*	Within 10 years from 31st August, 1921, 1921-24 $ 680,000 annually 1925 $1,088,000 1926 $1,632,000 1927-30 $2,040,000 ,, Three drawings in arrear.
Ditto, 2nd series	1921	$ 8,800,000	$ 8,800,000	$ 8,800,000	7	Mar. 31 Sept. 30	Not definitely secured	$10,000, $1,000 $100	100*	Between 1931 and 1935 by five drawings.
8% Bonds for re-funding Internal and Foreign Short Term Debts (96 million Loan)	1922	$96,000,000	†Y39,608,700 $56,391,300	$56,391,300	8	Jan. 31 July 31	Salt Surplus, or Customs surplus	$1,000, $100, $10	84 up	January, 1923—January, 1929 : Half-yearly redemption of : 1 at $2,255,652 4 ,, $3,947,391 4 ,, $4,511,304 4 ,, $5,075,217 Redemption in arrear.
**Chinese Government 8% National Loan of the 14th Year of the Republic	1925	$15,000,000	$15,000,000	$12,300,000	8	Mar. 31 Sept. 30	German Boxer Indemnity	$10,000, $1,000 $100	88	Half-yearly on March 31 and September 30, $ 900,000 during 1928-1929 $1,050,000 ,, 1930-1933 $1,500,000 ,, 1934
TREASURY NOTES : 11th Year Treasury Notes secured on Salt Surplus	1922	$14,000,000	$14,000,000	$ 3,500,000	1½% per month	deducted in advance	Salt Surplus	$10,000	100	(Not calling for interest, which have at once been deducted from issue price). $700,000 monthly from February, 1922 to September, 1923. Five payments in default.
**Special 8% Treasury Bonds of the 12th Year of the Republic	1923	$ 5,000,000	$ 5,000,000	$ 2,000,000	8	May 31 Nov. 30	Russian Boxer Indemnity	$10,000, $1,000	100	By half-yearly drawings of $1,000,000, starting on May 31, 1928, ending May 31, 1930.
**Special 8% Treasury Bonds of the 13th Year of the Republic	1924	$ 1,000,000	$ 1,000,000	$ 1,000,000	8	May 31 Nov. 30	Russian Boxer Indemnity	$10,000, $1,000	100	On November 30, 1930
Spring Festival Special Treasury Bills of the 15th Year of the Republic	1926	$ 8,000,000	$ 8,000,000	$ 8,000,000	8	Jan. 31 July 31	Consolidated National Loans Sinking Fund	$10,000, $1,000	82	By half-yearly instalments from July, 1928 to January, 1932. Redemption in arrear : 2 at $ 700,000 2 ,, $ 800,000 2 ,, $1,600,000 2 ,, $1,500,000
7% Famine Relief Internal Loan 1920	1920	$ 4,000,000	$ 2,168,475	$ 1,610,220	7	May 31 Nov. 30	Not definitely secured	$10,000, $1,000 $100, $10, $5	90	By 4 semi-annual drawings of $500,000 each, ending November, 1923. Three drawings in default.
**Treasury Bonds secured on Austrian Cancelled Indemnity	1926	$ 2,400,000	$ 2,400,000	$ 2,304,000	8	June 20 Dec. 20	Austrian Cancelled Indemnity	$10,000, $1,000	82	By instalments from Dec. 1928 to June, 1937 : 3 at $ 96,000 in December, 1928-1930 1 ,, $120,000 in December, 1931 4 ,, $144,000 in June and Dec. 1932-33 3 ,, $168,000 in June, Dec., 1934 and June, 1935 3 ,, $216,000 in Dec., 1935 and June, Dec., 1936 1 ,, $264,000 in June, 1937

*These bonds were exchanged against other previous issues at the ratio of $40 : 100.
†This portion (Japanese) for yen 39,608,700 is classified under foreign loan obligations.
**Secured on Customs Revenue.

Name of Loan	Issued in	Amount authorised	Amount issued	Outstanding Sept. 1, 1929	Rate %	Interest payable	Secured by	Denominations	Issue price	Repayment and remarks
TREASURY BONDS :										
*2½% Surtax Treasury Bonds, 1st (Shanghai) issue	1927	$30,000,000	$30,000,000	$ 4,000,000	8.4	Monthly	2½% Shanghai Customs surtax	$10,000, $1,000 $100, $10	100	$1,000,000 monthly, ending December, 1929.
*2½% Surtax Treasury Bonds, 2nd (Shanghai) issue	1927	$40,000,000	$40,000,000	$40,000,000	9.6	Monthly	2½% Shanghai Customs surtax	$10,000, $1,000 $100, $10	98	$1,000,000 monthly, beginning January, 1930 and ending April, 1933.
*2½% Surtax Treasury Bonds (Tientsin issue)	1928	$ 9,000,000	$ 9,000,000	$ 5,700,000	9.6	Monthly	2½% Tientsin Customs surtax	$10,000, $1,000 $100, $10	98	$300,000 monthly, between October, 1928 and March, 1931.
17th Year Treasury Bonds secured on the Rolled Tobacco Tax (1st issue)	1928	$16,000,000	$16,000,000	$ 7,500,000	9.6	Monthly	Rolled Tobacco Tax	$10,000, $1,000 $100, $10	98	$500,000 monthly, between April, 1928, and November, 1930.
18th Year Treasury Bonds secured on the Rolled Tobacco Tax (Second issue)	1929	$24,000,000	$24,000,000	$21,600,000	9.6	Monthly	Rolled Tobacco Tax	$10,000, $1,000 $100, $10	98	$480,000 monthly, April, 1929 to March, 1930. $600,000 monthly, April, 1930 to November, 1930. $960,000 monthly, December, 1930 to January, 1932.
*18th Year Famine Relief Treasury Bonds	1929	$10,000,000	$10,000,000	$ 9,500,000	8	June 30 Dec. 31	Increased Customs duty	$10,000, $1,000 $100, $10, $5	98	By 20 semi-annual drawings of $500,000 each, from June, 1929 to December, 1938.
*18th Year Customs Surplus Treasury Bonds	1929	$40,000,000	$40,000,000	$38,429,055	8.4	Monthly	Increased Customs duty	$10,000, $1,000 $100, $10	98	By 62 monthly instalments of $800,000 each (covering interest and capital redemption) beginning June, 1929, ending July, 1934.
INTERNAL LOANS :										
8% Internal Loan of the 17th Year for Military purposes	1928	$10,000,000	$ 6,000,000 $ 4,000,000	$ 9,500,000	8	June 30 Dec. 31	Stamps Tax of all China	$10,000, $1,000 $100, $10	98	By 20 semi-annual drawings of $500,000 each, from June, 1929 to December, 1938.
*8% Internal Short Term loan for the Rehabilitation of the country	1928	$40,000,000	$40,000,000	$32,000,000	8	June 30 Dec. 31	Increased Customs duty formerly Special tax on Kerosene and Gasoline	$10,000, $1,000 $100, $10	92 to 94	By 10 semi-annual drawings of $4,000,000 each, from December, 1928 to June, 1933.
*17th Year Short Term Currency Bonds of the National Government of China	1928	$30,000,000	$30,000,000	$29,100,000	8	Mar. 31 Sept. 30	Portion of former German Boxer Indemnity	$10,000, $1,000 $100	92	By 14 semi-annual drawings from March, 1929 to September, 1935. 7% annually in the first 3 years; 20% annually in the second 3 years; 19% in the 7th and last year.
*17th Year Long Term Currency Bonds of the National Government of China	1928	$45,000,000	$45,000,000	$45,000,000	2½	Mar. 31 Sept. 30	Customs surplus revenues	$10,000, $1,000 $100, $10	100	By 40 semi-annual drawings of $1,125,000 each, from March, 1934, to September, 1953. Issued for refund of unredeemed Hankow banknotes of 1926-1927.
*18th Year Troop Disbandment 8% Internal Loan	1929	$50,000,000	$50,000,000	$47,500,000	8	Jan. 31 July 31	Increased Customs duty	$10,000, $1,000 $100, $10, $5	98	By 20 semi-annual drawings of $2,500,000 each, from 31st July, 1929.
LOCAL LOAN ISSUES :										
*Hopei Province Short Term Loan for Haiho Conservancy Work	1929	$ 4,000,000	$ 4,000,000	$ 4,000,000	9.6	Apr. 15 Oct. 15	Tientsin Customs 5% surtax	$10,000, $1,000	100	From October 15, 1929 to April 15, 1939, by means of 20 half-yearly drawings of $200,000 each.
Wuhan Special Municipal Area's Internal Loan	1929	$ 3,000,000	$ 1,500,000	$ 1,500,000	8	June 30 Dec. 31	Municipal taxes collected at Wuhan	$1,000, $100, $10, $5, $1	100	Between June 30, 1932, and December 31, 1936, by means of 10 half-yearly drawings of $150,000 each.
Nanking Special Municipal Area's Internal Loan	1929	$ 3,000,000	$ 3,000,000	$ 3,000,000	7	June 30 Dec. 31	Municipal taxes and income from Municipal properties	$1,000, $100, $10, $5	not under 95%	By means of 10 annual drawings to be held at Nanking, beginning from December 31, 1930, ending December, 31, 1939, of $300,000 each.

*Secured on Customs Revenue.

Tokyo and Kobe Toll Cable

By SANNOSUKE INADA, Director-General of Telegraph and Telephone Engineering, Department of Communications, Japan

BECAUSE of economic and technical considerations, the application of toll telephone cables heretofore has been limited in Japan to short hauls, such as Tokyo-Yokohama, Kyoto-Osaka, Osaka-Kobe and Moji-Kurosaki, where suburban toll traffic was most congested. Nevertheless, in view of the progress made in telephone transmission engineering, it was decided, in connection with the third telephone expansion program of 1920, that a cable between Tokyo and Okayama could be provided economically. The circuits involve the main trunk lines of the Empire and cover a distance of approximately 800 kilometers (about 200 *ri*).

Work was started on the new cable in the fiscal year 1922. Although the construction schedule had to be somewhat altered, owing to the Earthquake, on the whole the initial plan has been followed and construction has been progressing in a satisfactory way, so that of the total distance the line between Tokyo and Kobe was opened for traffic on November 1, 1928, just before the Coronation. As a result, a speedier dispatch could be arranged for important conversations relative to the Coronation, and toll conversations between Tokyo, Osaka and the others of the six large cities, as well as other cities and towns along the route, can now be carried on far more easily than formerly.

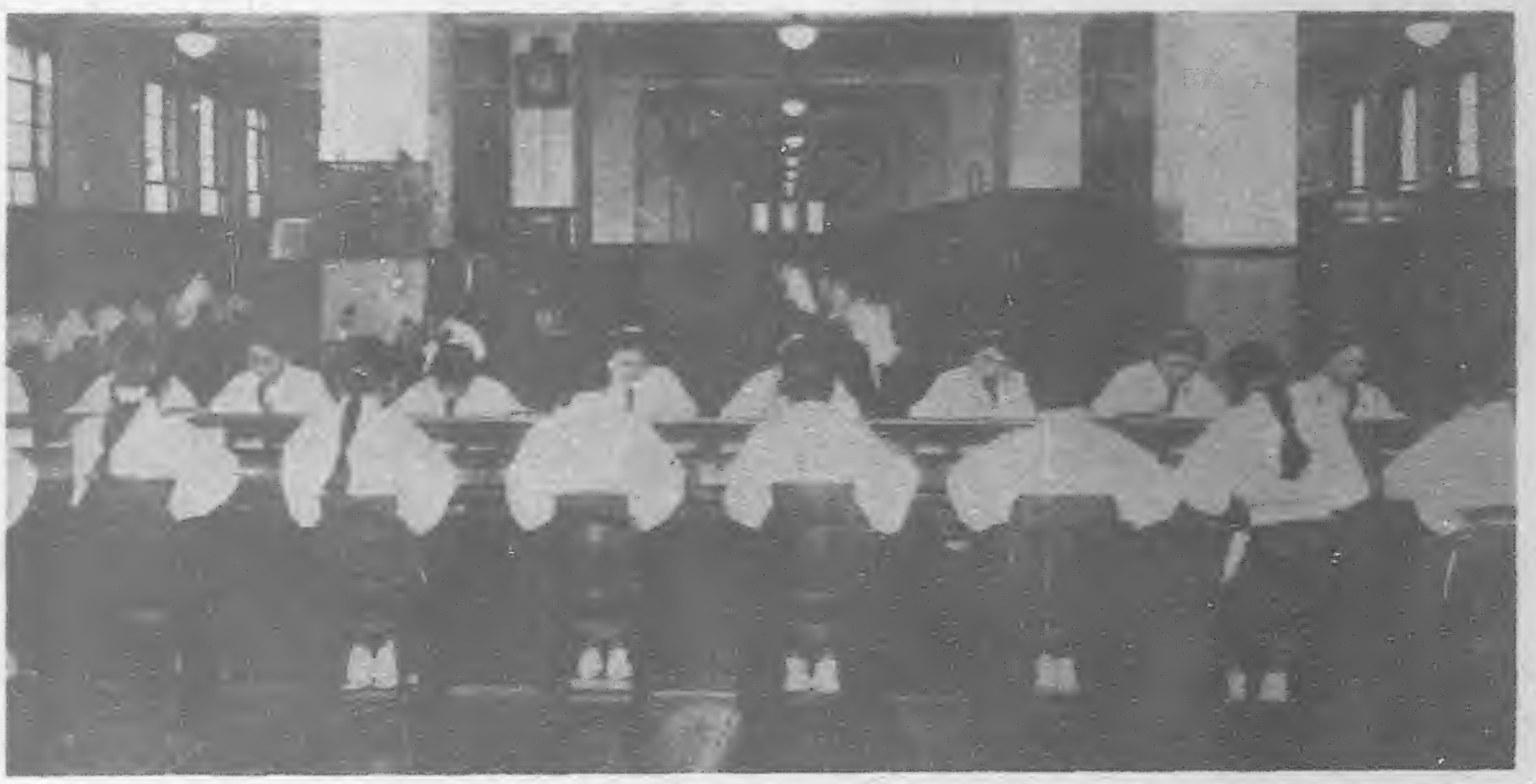


Fig. 1.—Toll Operating Room—No. 3 Toll Board. Tokyo Central Telephone Office. The Recording Boards are in the Foreground

Since the telephone cable just opened for traffic is one of the largest cable systems in the world, outside of the United States of America, and is an epoch-making achievement in long-distance telephone communications in Japan, a summary will be given in this paper of its design features and the installation work involved, as well as plans for the future extension of the cable system.

Fundamental Considerations

Toll telephone circuits in Japan heretofore have consisted mostly of bare overhead wire lines. Bare overhead wire is, however, extremely difficult to maintain and cannot be secured absolutely against storms or various troubles arising from human acts (see Table No. 1). Moreover, the use of a mixed line, consisting of short lengths of cable and aerial bare wire, renders the quality of conversation poor.

The development of commerce and industry, the resulting transportation and traffic congestion, and the advancement in other fields of endeavor caused a great demand for telephone service between cities and towns separated by long distances. The demand could not be met with perfect smoothness or full satisfaction even with additions made year after year to the toll lines which then existed.

If an attempt had been made to furnish the many telephone line additions required by stringing of overhead wire, the maintenance difficulties would have been great and the cost of construction for the project as a whole would have been prohibitive. Consequently, it was found necessary to supersede aerial bare wire lines by some other form of construction.

Telephone conversations through cable, prior to the time when telephone repeaters and loading coils were developed fully, were limited to a few tens of kilometers, with consequent limitation in the use of cable circuits. Improvements in vacuum tube repeaters and loading coils, however, have made the transmission of speech through cable circuits possible for a distance up to 8,000 kilometers. Thus, along with the great advance in long-distance speech transmission, troubles due to storms, rain, snow, etc., have been reduced, with resultant economy in maintenance by the adoption of cable circuits. As a consequence, in Europe and America, various countries, one after another, are installing cables for their important toll trunks, so that the present project may be said to result from the demands of the age.

With aerial wire lines, telephone circuits may be added each year, according to demand, up to the limited capacity of the pole line. Consequently the annual construction cost is comparatively not large. In a cable, however, due to its construction, the number of circuits cannot be limited to the present need, but it is necessary to provide a large cored cable to care for future growth; and as a consequence, a greater initial investment cannot be avoided.

For the reasons mentioned, in making up the present budget for the telephone expansion project a decision was reached to install a cable line between Tokyo and Okayama, this route being the most important of all the toll trunks. The route was divided into several divisions ; and construction work has been continued since the fiscal year 1922 for each division separately so that there might be no interference with the general telephone expansion program. As a result, the portion between Tokyo and Kobe was completed this Fall.

TABLE NO. 1—NUMBER OF TROUBLES PER 100 KM. OF TELEPHONE WIRE

Year	1916	1917	1918	1920	1921	1922	1923	1924	1925	1926	1927	Av.
No. Troubles per 100 Km. of Wire ...	4.5	4.3	5.3	4.8	5.0	6.5	2.5	4.8	4.0	3.7	4.0	4.5
Duration, Hours ...	23	26	32	31	41	47	19	31	23	21	23	29

Design

CIRCUIT.—Intermediate loading coils are inserted in the cable circuit at distances of approximately 1,830 meters to reduce the attenuation rate of speech current, and telephone repeater stations are employed at distances of from 100 to 150 kilometers. When

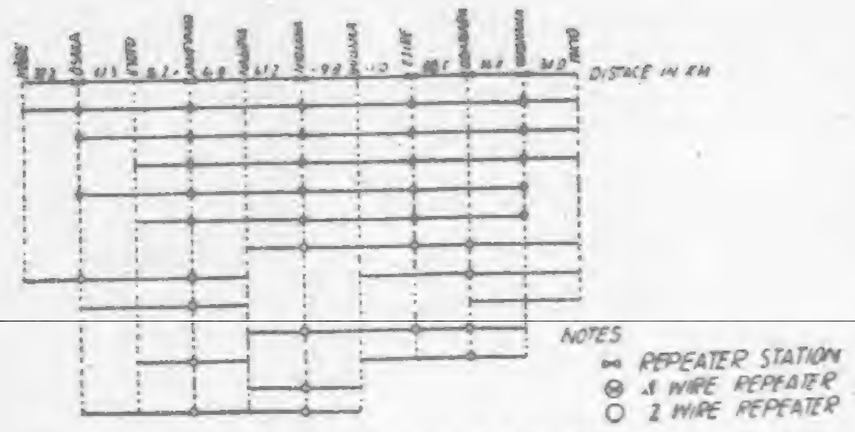


Fig. 2.—Lay-out of Toll Cable Between Tokyo and Kobe

the distance between two terminal stations does not exceed 400 kilometers, so-called two-wire system telephone circuits are used, each circuit consisting of two wires (a pair) of a cable and equipped with two-wire system telephone repeaters, suitably spaced. When this distance exceeds 400 kilometers, so-called four-wire system telephone circuits are used as standard, each circuit consisting of four wires (two pairs) of a cable and equipped with four-wire system telephone repeaters, suitably spaced. Thus, two-wire circuits are used between Tokyo and Nagoya ; four-wire circuits between Tokyo and Kyoto, also between Tokyo and Osaka.

Speech current, attentuated in passing through a cable circuit, is amplified by telephone repeaters. It will attenuate again before reaching the receiving end, but the location of repeaters is so selected according to the length and kind of circuit that the speech will reach the terminal in such volume that it can be heard without any difficulty. Figure 2 shows the location of telephone repeaters for the main circuits between Tokyo and Kobe.

Cable Plan.—As mentioned above, in determining the number of pairs in a cable it is necessary to take into consideration future circuit requirements. In Japan, the rate of increase of telephone lines has been very great, especially in various localities between Tokyo and Kobe ; and it is thought impossible to meet all the demands for many years over ten with a single cable. Adopting the largest size allowable from the standpoint of construction, and considering the status of traffic at the time of planning (1921), the number of circuits required between principal cities for the next ten years is forecast as follows :

	No. of Ccts.	No. of Ccts. at end of 1921
Tokyo-Osaka	54	6
Tokyo-Kyoto	6	1
Tokyo-Kobe	12	1
Tokyo-Nagoya	18	6
Tokyo-Shizuoka	12	4
Nagoya-Osaka	27	11
Nagoya-Kyoto	12	4
Nagoya-Kobe	6	0
Yokohama-Kobe	3	0
Yokohama-Osaka	6	0
Yokohama-Kyoto	3	0

In addition, the number of telephone lines of shorter lengths was estimated for inclusion in the cable. It was decided to use a cable containing a total of 184 pairs of wire : 54 pairs of 1.3 mm. wire suitable for two-wire system circuits ; 130 pairs of 0.9 mm. wire for four-wire system circuits, and two-wire system circuits of short length. The cable is quadded, paper-insulated and lead-covered. (Figure 3).

Loading Coil Arrangement.—It is planned to equip every point of loading (*i.e.*, each of the points 1,830 meters apart on the cable) with one loading coil case for 27 quads (all for four-wire system), one case for 35 quads (all for four-wire system), and one case for 30 quads (21 quads for four-wire system and 9 quads for two-wire system). The coils are designed to give the following inductance value to each conductor of a quad :

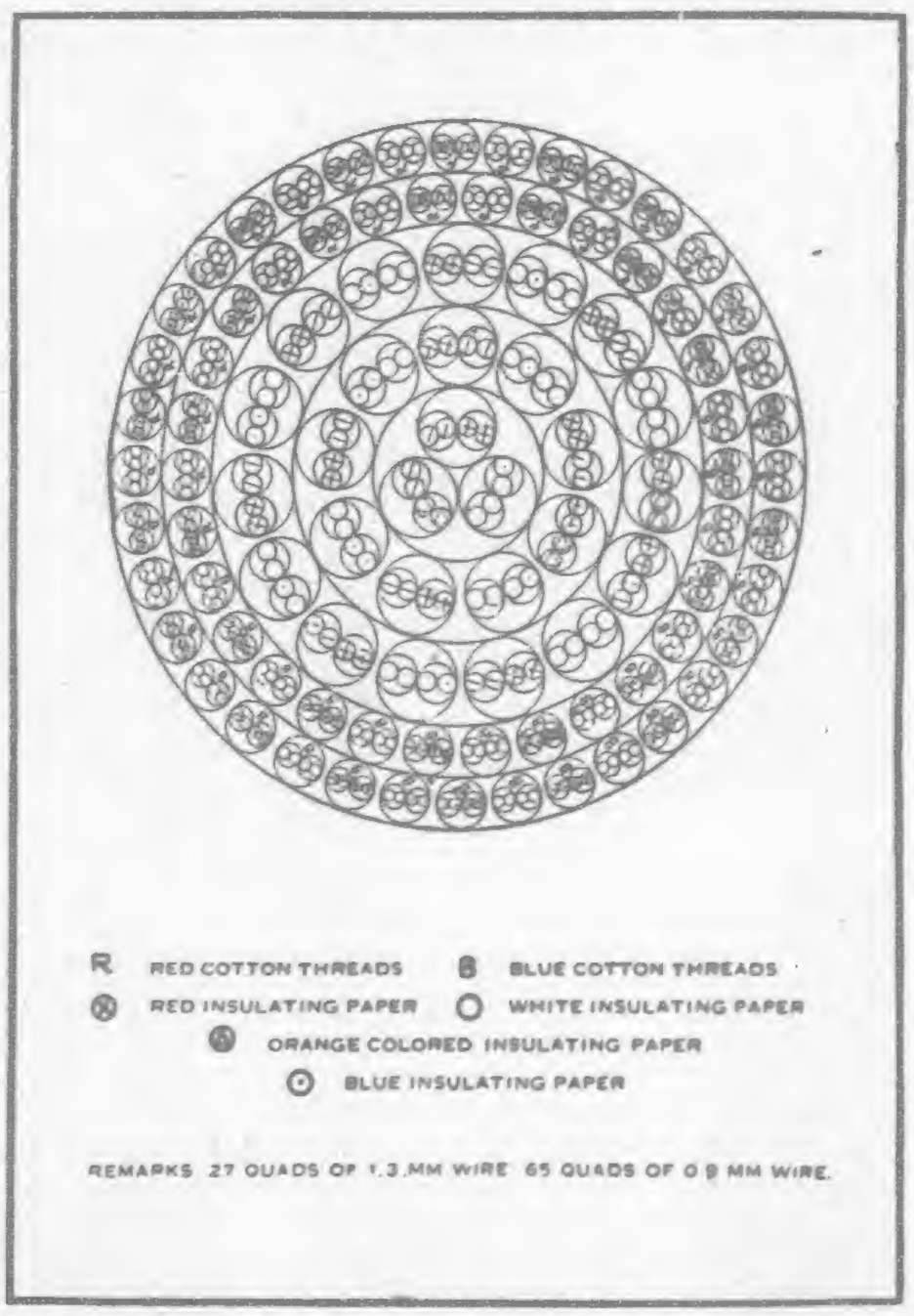


Fig. 3.—Cross-section of 184 Pair, Phantomed, Lead-Covered and Paper-Insulated Cable

Kinds	Standard Value of Inductance Millihenrys: 2-Wire System	4-Wire System	Remarks
For Side Cct. ...	177	178	Measured by A.C., 2 mil. liamps, 1800 cycles.
For Phantom Cct.	107	64	Allowable limits, –2%

For a phantom circuit formed by each loading unit, leakage between the coils, including the leads, when measured with an alternating current of 900 cycles and 2 milliamperes, is within the following limits :

Kind of Ccts.	Max. (in C.G.S. units)	Average
Between Side Ccts.	100	40
Between Side and Phanton Ccts. ...	200	80

In the inital installation, one loading coil case for 27 quads was installed at every point of loading in each division completed, thus opening telephone traffic in the division and utilizing the completed cable as much as possible. With the completion of the cable installation between Tokyo and Kobe, loading coils for 35 quads were added, thereby opening four-wire system toll telephone traffic over lines going to Kyoto, Osaka and Kobe from Tokyo and Yokohama. When it is necessary, loading coils for 30 quads will also be added. The loading coils adopted are of the most up-to-date type used in both Europe and America, with cores of compressed iron particles.

Telephone Repeater Stations.—The telephone repeater stations are so designed that the station buildings and the various equipment can be accommodated to the second cable line when in the future it is added between Tokyo and Osaka. Repeaters are equipped as shown by the accompanying table for circuits needed at present, and they will be increased in number as the necessity arises.

The two-wire repeaters are of the newest type, consisting of the usual vacuum tube two-way amplifier. It is provided with auxiliary equipment such as current supply circuits, alarm circuits, intermediate signalling circuits, etc., and is suitable for a gain of 19 tu[2]. A four four-wire repeater is made up of two sets of amplifiers, each containing two vacuum tubes. One set is used for transmitting in one direction and the other set for transmitting in the opposite direction. Under normal conditions the repeater is suitable for a gain of 42 tu at 1,000 cycles per second. It is equipped with auxiliary current supply and alarm circuits, as is a two-wire repeater ; and in the case of a terminal station where it is necessary to connect four-wire circuits directly with subscribers' circuits, terminal equipment is provided.

In a telephone repeater station power equipment and testing equipment are provided in addition to repeaters, as indicated below. The power equipment receives A.C. power from some outside source and converts it into D.C. power by means of a motor-generator set, charges a battery and supplies current to the repeaters. To provide for power failure, a spare generating equipment is installed. (Figures 4, 5, and 6.)

Name of Stations	Number of Repeaters: 2-Wire System	4-Wire System	Total
Yokohama	...	46	46
Ashigara	49	...	49
Yeziri	25	44	69
Toyokawa	26	44	70
Kameyama...	50	44	94
Osaka	11	45	56
Total for Six Stations	161	223	384

Construction Features and Progress

There are certain advantages and disadvantages in an underground, as compared with an overhead cable line. In various countries in Europe underground systems are generally adopted, while in America overhead systems, as a rule, are employed.

In Japan, after due consideration to the budget and the construction facilities, parts of sections where overhead construction should not result in trouble are made aerial, while other parts employ underground construction. Thus, between Tokyo and Kobe about one-half of the cable line is placed overhead and the other half underground.

In order to provide for an additional aerial cable line in the future, the overhead parts of the system are constructed as follows:

POLES.—Poles of 7.3 meter length impregnated with copper sulphate or creosote are used as standard. When the length exceeds 10 meters, steel towers are used.

POLE SPACING.—Standard spacing is 30 meters, and when it exceeds 70 meters the cable is suspended by a catenary line.

SUSPENSION.—A special steel stranded wire, having a cross section of 65 square millimeters and tensile strength of 7,300 kilograms, is used.

TOWERS FOR LOADING COILS.—Reinforced concrete construction is used chiefly, and in order to allow room for six loading coils, each tower is provided with a platform 5.5 meters by 4.5 meters. (Figures 7 to 10 inclusive.)

The underground system is constructed as follows:

A line of cast-iron pipes, each having an internal diameter of 75 millimeters, is buried in places where the water-line is near the surface of the earth, and in other places two-holed earthen conduits or two-holed concrete conduits are used. In case cast-iron pipes are used under a paved road, or in other places where access is difficult, a spare pipe line is installed. Where roads are much curved, or where conduits cannot be advantageously installed, armored cables are used.

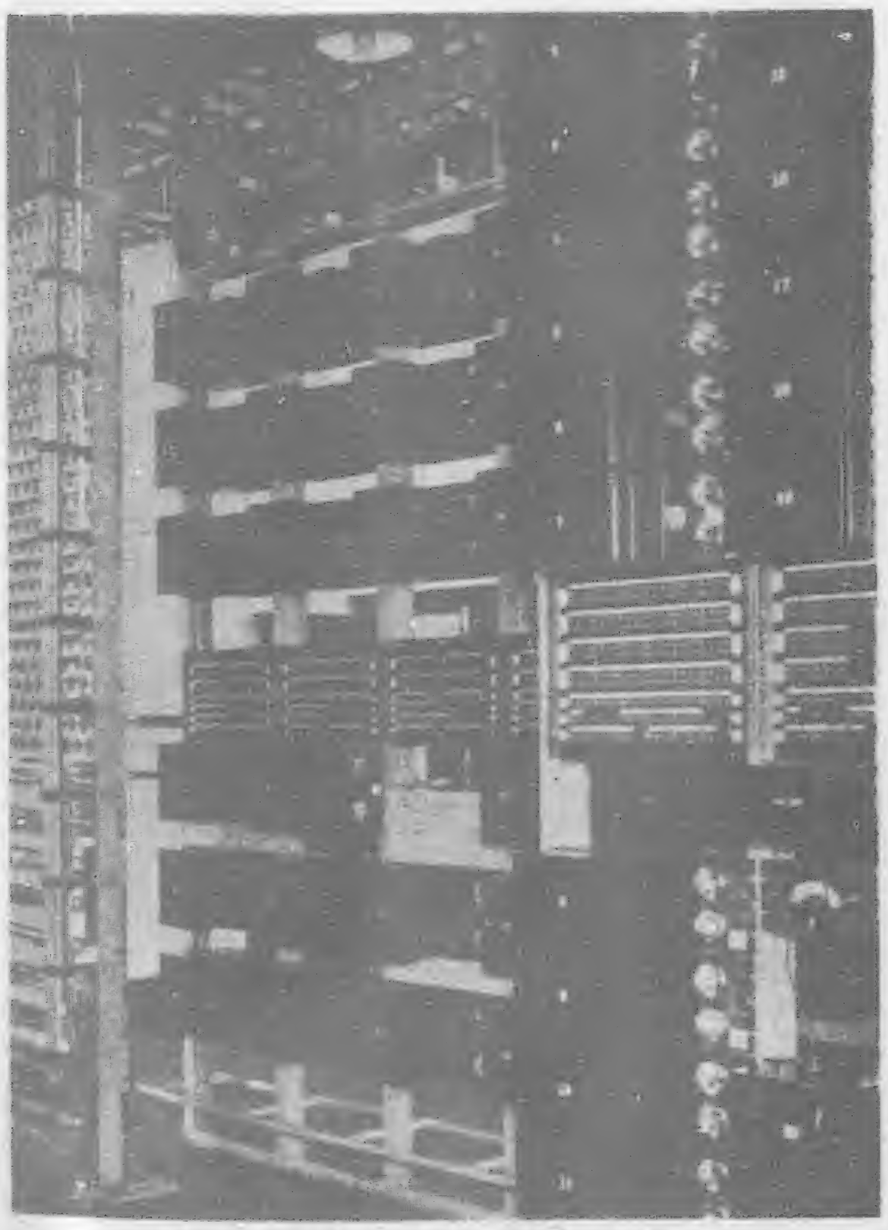


Fig. 5.—Repeaters, Odawara

Manholes are constructed either of reinforced concrete or of bricks, and provisions are made to prevent water from entering them. In manholes, where it is necessary to place loading coils, provision is made, corresponding to the overhead line procedure, to install six in one hole by constructing it 2.6 meters long, 1.8 meters wide and 3 meters deep, internal dimensions. Manholes located in places where it is required to test the cable are constructed to internal dimensions of 1.8 meters long, 1.2 meters wide and 1.3 meters deep. Manholes in other places are constructed to smaller dimensions.

In places where the cable crosses rivers, a field investigation was made in each case to determine whether overhead or underground construction should be adopted. In some cases steel towers were put up on both banks and in rivers, suspending the cable from catenary lines; and in other cases special bridges for the cable were constructed, or the cable was strung along existing bridges. (Figures 11, 12 and 13.)

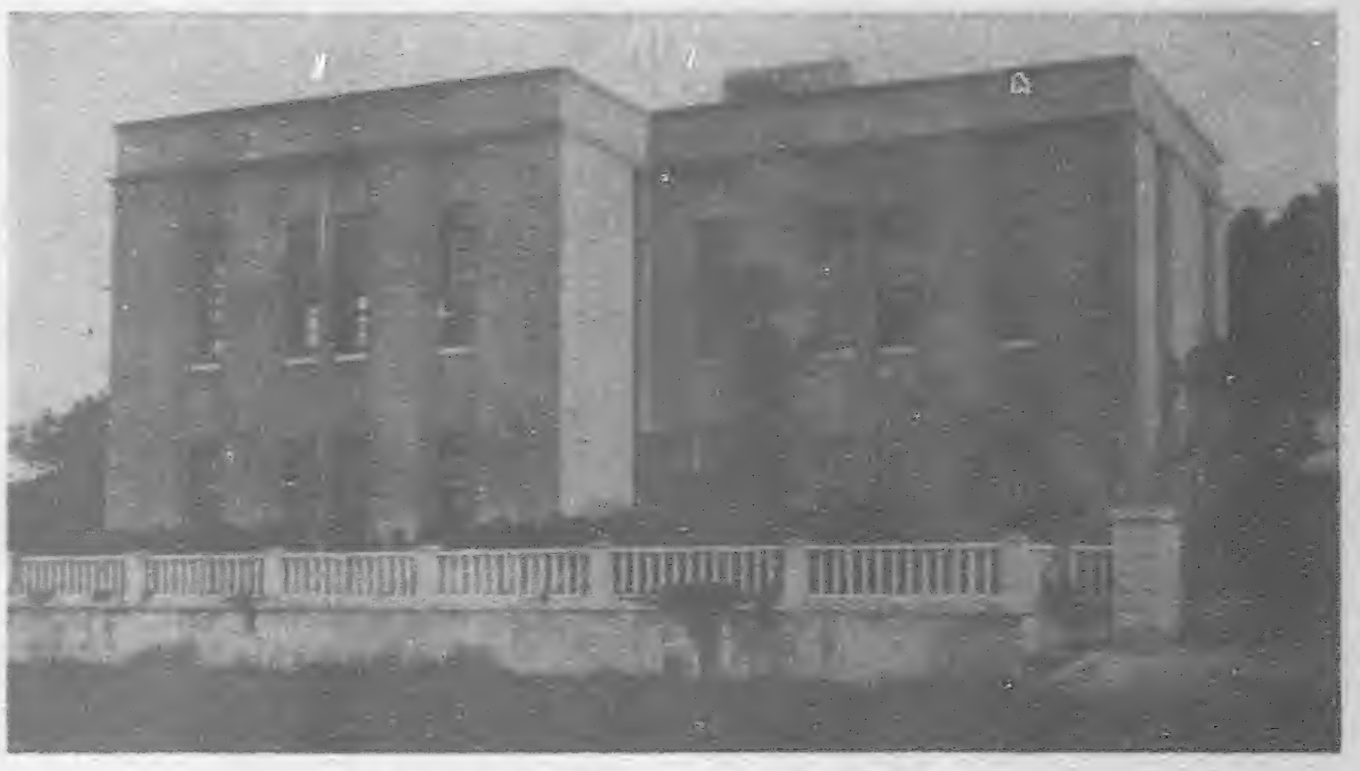


Fig. 4.—Repeater Station, Odawara

Progress of Installation Work

It was initially planned to complete the construction work between Tokyo and Odawara in 1923; between Odawara and Shizuoka and between Nagoya and Kyoto in 1924; between Shizuoka and Hamamatsu and between Kyoto and Osaka in 1925; between Hamamatsu and Nagoya in 1926; and between Osaka and Kobe in 1927, thus completing a route from Tokyo to Kobe. Owing, however, to the Kanto Earthquake of September, 1923, the start of work in Tokyo-Teishin district was delayed. As a consequence, a part of the cables, loading coils, etc., which was purchased for the Tokyo-Odawara division and which had not been used, was installed between Nagoya and Kyoto. Traffic was thus, at first, opened in the Nagoya-Kyoto-Osaka division. Other minor changes were made in the construction schedule. Work was completed as shown in the table given below, the route between Tokyo and Kobe being finished on November 1, 1928.

In general, the cable route is selected for laying along highways; but in parallel with the latter are the telegraph, telephone, light and power lines of bare overhead construction, or railways of the Teishinsho, Government Railway Department, prefectures, or private companies. In addition, the route has the sea on one side and mountains on the other, and in some places it crosses large rivers. In view of this situation, the cable had to be laid in safe zones separated a reasonable distance from the obstacles mentioned, with each loading point spaced exactly at 1,830 meters. Accordingly, in selecting the route a careful survey was made for alternative routes. Many changes in routes were made, owing to reconstruction of highways or bridges or the building of a house. In each case the route between two repeater stations had to be resurveyed because of the necessity for maintaining proper spacing for the loading coils.

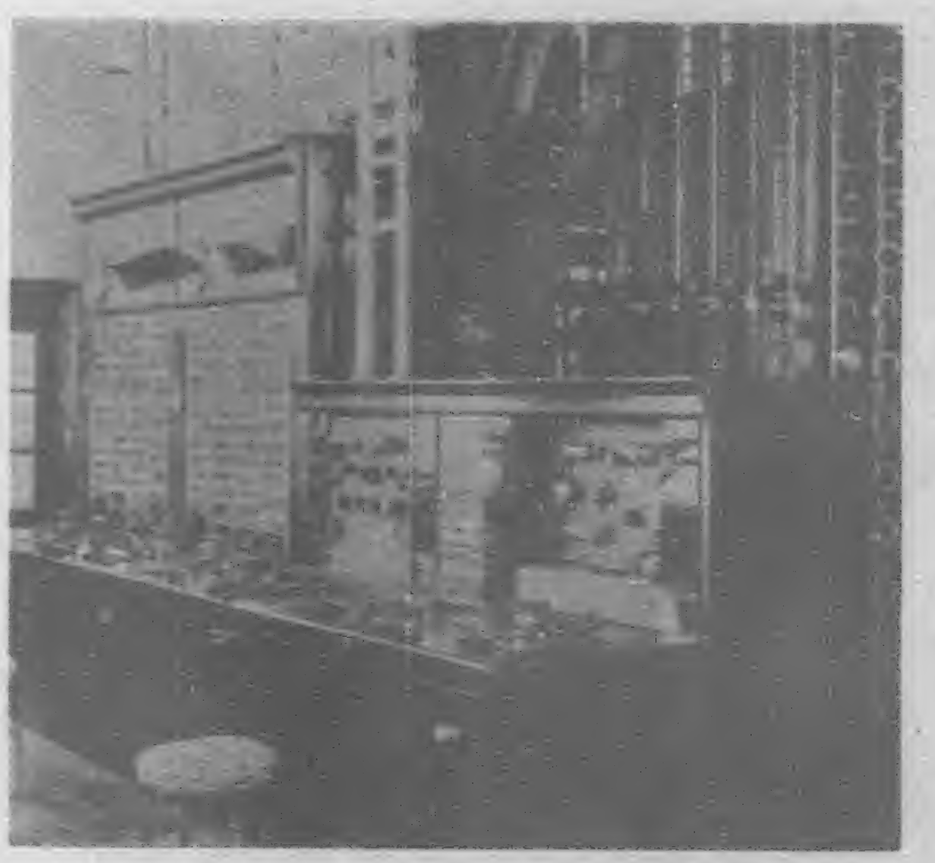


Fig. 6.—Repeater Station—Testing Equipment

The decision was finally made to lay the cable as follows :

TOKYO-YOKOHAMA SECTION : UNDERGROUND SYSTEM.—The cable was laid in the national highway before it was reconstructed last

YOKOHAMA-ODAWARA SECTION.—Partly underground in the national highway and partly overhead along it.

ODAWARA-NUMAZU SECTION.—Since neither the old nor the new national highway in the Hakone is suitable for an underground system, the section between Hakone-Yumoto and Ashino-yu is mostly of overhead construction through Takanosu Pass ; and the rest also is mostly of overhead construction, generally along the national highway.

NUMAZU-SHIZUOKA SECTION.—The cable between Numazu and Suzukawa is mostly hung overhead along the railway ; between Suzukawa and Yui it is buried underground in the national highway ; between Yui and Okitsu it passes aerially over Sassui Pass ; and thence it is run to Shizuoka mostly along the national highway, partly underground and partly aerial.

SHIZUOKA-TENRYUKAWA SECTION.—Partly underground and partly overhead along it.

TENRYUKAWA-MIYU SECTION.—As it is difficult to cross Lake Hamana, the cable is laid partly underground in a prefectural highway called Old Hime-Kaido and partly overhead along it, across Honsaka Pass.

MIYU-NAGOYA SECTION.—Mostly overhead along the national highway between Miyu and Okazaki, and the prefectural highway through Tenpaku between Okazaki and Nagoya ; underground from city limit of Nagoya to Nagoya Station.

Fig. 7.—Reinforced Concrete Aerial Cable and Loading Coil Platform

Fig. 8.—Structural Steel Loading Coil Platform

Length, Kilo.

Division	Underground	Aerial	Total	Date of Completion	Remarks
Tokyo-Yokohama ...	34.0	—	34.0	Sept. 11, 1927	Yokohama Repeat. Sta. opened for traffic on September 11, 1928.
Yokohama-Ashigara	32.0	24.4	56.4	Nov. 21, 1926	Ashigara Repeat. Sta. opened for traffic on Nov. 21, 1926.
Ashigara-Numazu ...	9.9	28.7	38.6	Sept. 11, 1927	
Numazu-Shizuoka ...	30.0	30.9	60.9	Nov. 16, 1927	Yeziri Repeat. Sta. opened for traffic on Sept. 15, 1928.
Shizuoka-Mitsuke ...	31.0	35.5	66.5	Oct. 6, 1928	
Mitsuke-Toyokawa ...	14.6	38.7	53.3	July 1, 1927	Toyokawa Repeat. Sta. opened for traffic on July 1, 1927.

Length, Kilo.

Division	Underground	Aerial	Total	Date of Completion	Remarks
Toyokawa-Nagoya ...	23.9	43.3	67.2	June 16, 1927	
Nagoya-Kameyama	16.2	45.6	61.8	Aug. 16, 1925	Kameyama Repat.Sta. opened for traffic on Aug. 16, 1925.
Kameyama-Kyoto ...	56.6	29.6	86.2	Aug. 16, 1925	
Kyoto-Osaka ...	52.3	—	52.3	Oct. 30, 1926	Osaka Repeat. Sta. opened for traffic on Nov. 1, 1928.
Osaka-Kobe ...	32.2	—	32.2	Nov. 1, 1928	
Total ...	332.7	276.7	609.4		

NAGOYA-KYOTO SECTION.—Underground within the city limit of Nagoya, and thence overhead to Seki, along the Kansai railway line ; overhead along the national highway from Seki to Kusatsu through Suzuka Pass, except over the Pass, where an armoured cable is used ; underground from Kusatsu to Kyoto.

KYOTO-OSAKA SECTION.—All underground in a prefectural highway called Old Saikoku Kaido.

OSAKA-KOBE SECTION.—All underground in the national highway lately reconstructed.

Many dangers and difficulties were encountered in the transportation and installation of the cables and loading coils, inasmuch as the cable route traversed high and steep mountain paths such as Hakone, Housaka and Suzuka, and large rivers such as Akagawa, Fujikawa, Oikawa, Tenryukawa, Kisogawa, Ibigawa, Setagawa, and Yodogawa. Fortunately, the work has been completed without any serious accident.

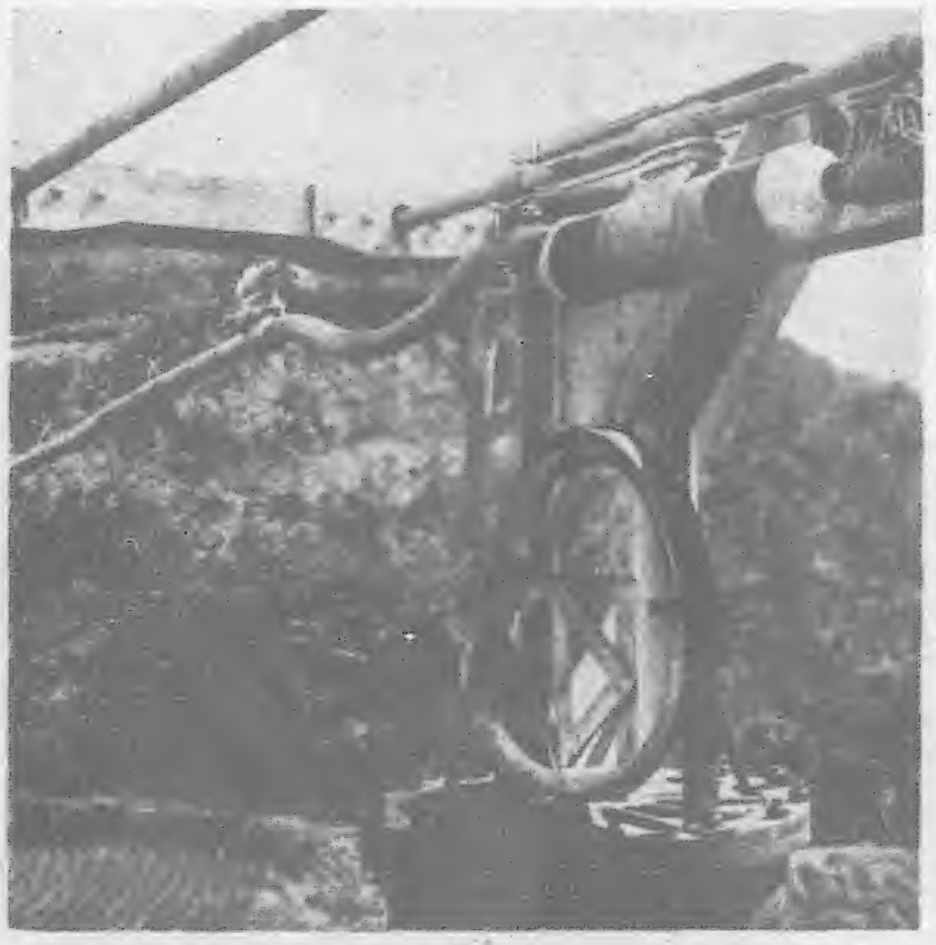


Fig. 9.—Cable Joint, Coil and Stub, on Loading Coil Platform

Fig. 10.—Reinforced Concrete Loading Coil Hut

Supply of Principal Materials

CABLE.—As previously mentioned, the cable adopted is suitable for phantom working and consequently differs from suburban toll cable heretofore used in Japan for short distances, such as between subscribers in the same city or within the city boundary for lines incoming to a city. Since home manufacturers had no experience in the manufacture

of the type of cable required, the part employed between Tokyo and Odawara and also between Nagoya and Osaka, totalling approximately 98,500 meters, was supplied by the Western Electric Company, U.S.A. It was found afterward, however, that the Sumitomo Electric Wire & Cable Works, Ltd., the allied Cable Company of the Nippon Electric Company, Ltd., and others, after careful researches into the method of cable manufacture, could produce cables which were not inferior to those imported. Consequently, the cable of home manufacture was adopted for the entire remaining parts, totalling 542,400 meters.

LOADING COILS.—The first loading coils used were imported. Subsequently, however, the Nippon Electric Company, Ltd., Tokyo, has been producing coils not greatly different from those made in the United States of America, and they have since been purchased along with the imported product.

Fig. 11.—Steel Tower for Cable Crossing the Sakai River, near Hakone

Fig. 12.—Armoured Cable placed on Railroad Bridge across the Tenryu River

Between Tokyo and Kobe 698 cases of loading coils were used. It is planned to install loading coils for 30-quad use between Tokyo and Osaka in the fiscal year 1929.

TELEPHONE REPEATERS.—As no home manufacturer had had experience in the manufacture of telephone repeaters, all the apparatus and materials installed initially at Kameyama Repeater Station were supplied by the Western Electric Company, through the Nippon Electric Company. In subsequent installations, however, only apparatus and materials which could not be manufactured in Japan were imported. In the other cases articles made in Japan were adopted.

MISCELLANEOUS. — Such materials as cable hangers, used in suspending the aerial portions of the cable, hanger connectors and cable rings, estimated to be required between Tokyo and Shizuoka, were imported. Subsequently trial supplies were ordered from home makers and, inasmuch as they proved satisfactory, the home product has since been used exclusively.

Future Plans

In view of the fact that the cable just opened for traffic between Tokyo and Kobe will, in the near future, have no spare lines because of the demand for toll telephone circuits, it is planned to install a second cable. There is a necessity also for extending the present cable in various directions within ten years (Fig. 14). In the direction of the south-west it will be extended from Kobe, *via* Okayama and Hiroshima, to Shimonoseki, and thence to Fukuoka and Kumamoto across the strait, branching out to Nagasaki. In this division traffic is expected to be opened in 1929 between Kobe and Okayama and also between Moji and Fukuoka; in 1927 traffic was opened between Fukuoka and Kurume. In the direction of the north-east the cable will be extended from Tokyo, *via* Utsunomiya and Sendai, to Aomori, thence across the strait to Hakodate, and, *via* Odaru and Sapporo, to Asahigawa. The cable between Tokyo and Koyama was scheduled for completion in 1928; the cable between Koyama and Utsunomiya, also between Otaru and Sapporo, for completion in 1929. The extension between Aomori and Hakodate was completed in 1926 by the connection of the land and submarine cables. In addition, most of the divisions considered as toll trunks, such as those from Tokyo to Matsumoto *via* Kofu, from Nagoya to Toyama *via* Gifu, Fukui and Kanazawa, from Kyoto to Fukuchiyama, from Osaka to Tanabe *via* Wakayama, and from Okayama to Takamatsu, will be changed over from the existing bare wire lines to cables, thus insuring safety and smoothness in telephone conversations between the all-important cities of the country.

Fig. 13.—Toll Cable placed under Bridge—Oi River

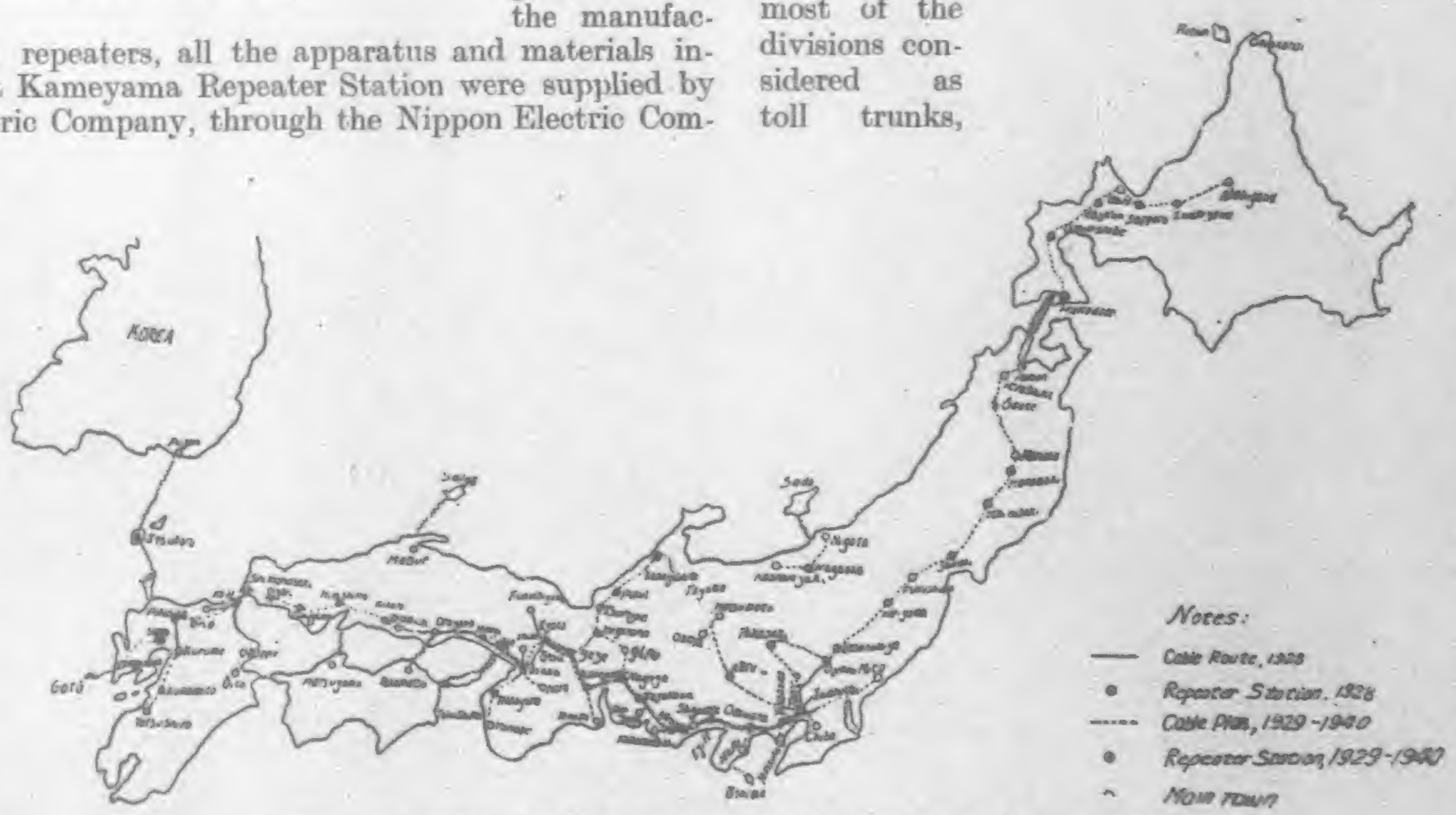


Fig. 14.—Main Toll Telephone Cable as Scheduled to 1940

New Mitsui Bank Building in Tokyo

THE new Mitsui Bank Building has been in the minds of the heads of the Mitsui organization for a long time and for this reason has been planned to the minutest detail to represent that institution and to carry on its work in the most fitting manner. The driving force behind this magnificent structure is Baron Takuma Dan, whose work in the extension of Japanese finance and business to its commanding position in world markets and the expansion of the Mitsui enterprises to one of the most important in the Empire of Japan received recognition in his elevation to the peerage at the time of the Enthronement last Fall.

The architectural treatment follows the best conservative American practice, using classical precedents and treating them in a modern spirit.

The exterior of the building, which is finished in Inada granite, is a modern adaption of Roman classical style, with the three façades embellished by Corinthian columns 69 inches in diameter and 50 feet high. They support a frieze storey and attic, comprising the third and fourth floors, with a fifth storey set-back.

The third floor is embellished with plaques, between the windows, bearing symbols of some of the varied enterprises of the Mitsui organization.

There are two basement stories below the street level, making the total height of the building 125 feet from the top of the foundation mat to the roof.

Three large courts, each 50 feet square, give light to the interior rooms and corridors of the upper floors and to the main banking room below.

The main banking room covers the entire first floor and is 40 feet high, 330 feet long and 145 feet in width. The room is surrounded by a wide mezzanine gallery.

The architectural treatment of this room is a modified classical style, leaning somewhat towards Italian renaissance, the materials used being Italian Botticino marble for the columns and walls and Roman travertine levanto and black and gold marble for the base and floor.

The ceiling is of ornamental plaster, which has been treated with pure pigments so disposed and blended as to produce a soft, harmonious color scheme which adapts itself to the pleasing unit.

There are three main entrances to the building. One on Honkawaya-cho for access to the upper floors, one on Muromachi, the main entrance to the Trust Company, and one on Surugacho, which leads to the bank. Two rear entrances are devoted to the employees and service.

The three large skylights, which afford daylight to the banking room, are fitted with manually operated shutters, which close out the direct rays of the sun but allow the filtered light to enter. These skylights are protected from falling objects by a network of cables and wire mesh at the top of the courts and by wire mesh directly above the skylight, while an additional wire mesh below the ceiling lights protects the room below from falling glass.

The basement of the building contains an extensive safe deposit vault system, with coupon room department which is unusually well constructed and protected against attack.

The walls, floor and roof of the vault are of concrete 30 inches thick, heavily reinforced with compact layers of heavy expanded metal mesh, which, tests have proven, form a most formidable type of resistance to the attack of drill and torch.

The inside floor and roof of this vault are protected with 3-inch thick steel lining built up of a first layer of open hearth steel $1\frac{1}{4}$ inches thick, a second layer of torch-resisting metal $1\frac{1}{4}$ inches thick, and an inner layer of one-half inch thick open hearth steel. The plates average about four feet by ten feet in size and are lapped so that all joints are broken. Each plate is screwed to the other plate by means of large open hearth screws.

Entirely surrounding the outside of the vault is an electric vault protection system consisting of lead-covered electric cables set three inches on centers, in three circuits for each wall, the floor and the roof. This cable system operates on a closed circuit relay mechanism, and the instant any cable is cut an inside alarm situated in the guard room and an outside alarm in an inconspicuous location at the main entrance are operated, warning the police of trouble. The guard-room alarm indicates by annunciator at what point the attack is being made.

The inside walls and ceilings of this vault are finished in stainless polished steel with tile floors and marble base.

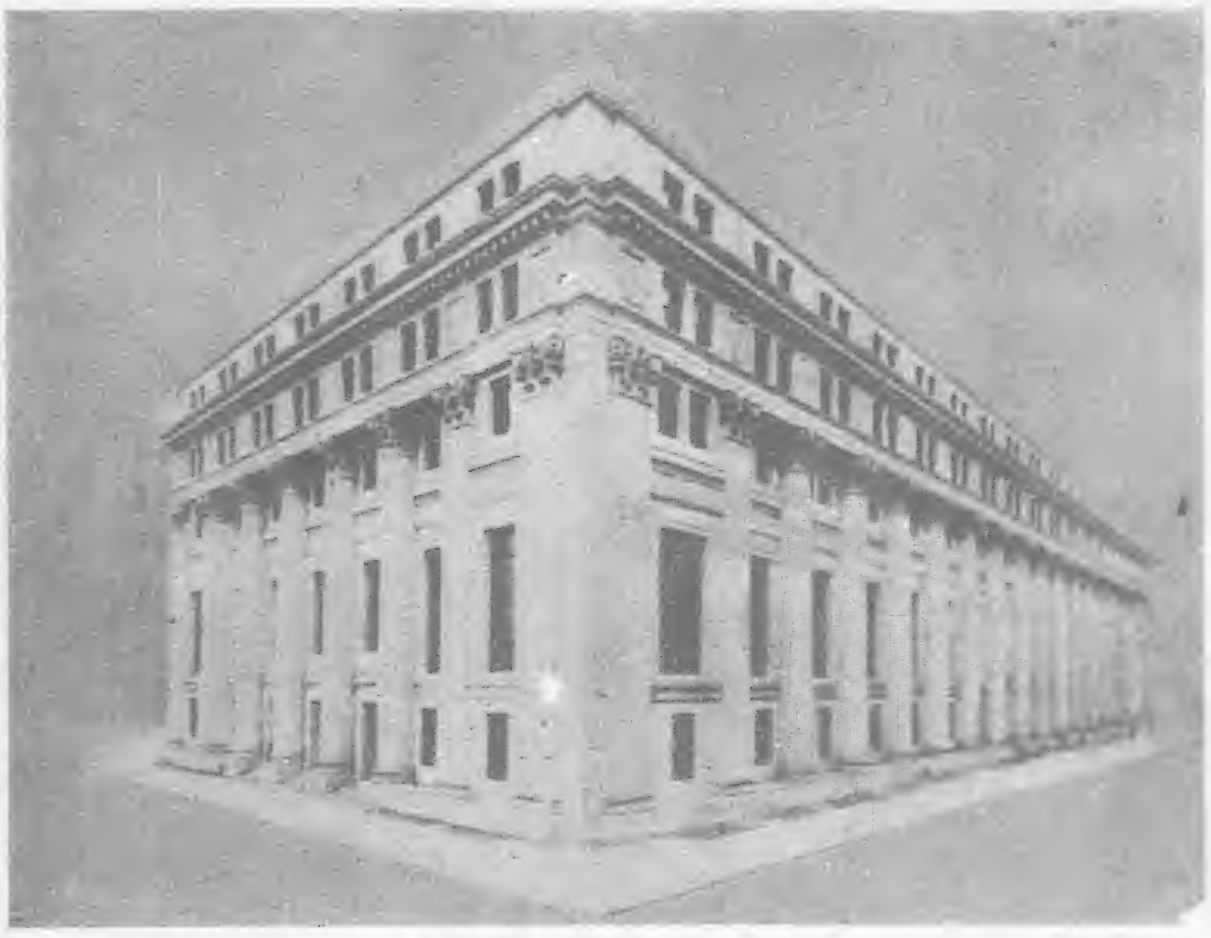
There are over six thousand private safe deposit boxes in this vault, all fitted with an interchangeable key lock. After a customer vacates a box the key combination is changed, thus protecting a new customer from having an old one use a duplicate key on the same box.

The Trust Company bank security vaults, located on the first floor, are built up and protected in the same manner as the safe deposit vaults.

The main doors of the safe deposit vault and security vault are 21 inches thick, 8-ft. 3 in. in diameter, and, together with the frame, weigh 52 tons each.

These doors contain copper specially treated for resistance to the oxy-acetyl ne torch, and pneumatic drills and tests show that they are virtually impregnable to any known method of criminal attack.

Each door is equipped with a six tumbler combination bank lock with the latest improved four-movement seventy-two hour time locks.



New Mitsui Building

These doors, being circular in form, extend below the floor level, and in order that the doors may be opened or closed, sections of the floors are mechanically operated so that they may be lowered or raised as the door is operated; this keeps the floor around the door at the same height as the main lobby.

The bank quarters on the first floor are protected against a day raid or hold-up by means of foot rails placed at intervals behind the bank screen. Each rail is connected with flash light annunciators and alarms situated in the guard-room, and an upward pressure of the toe on the rail operates this alarm. The system is worked on a closed circuit arrangement.

The basement and sub-basement are mostly devoted to the mechanical equipment of the building, including fans, blowers, oil filters for air cleaning, air heating plant, refrigeration plant for air cooling, water heating plants for building heating and general hot water supply, transformer room, switchboard room, storage battery and charging rooms, fire and house pumps, air compressors, sewage ejectors, water storage tanks, pneumatic tube central station and blower room and emergency gasoline electric generators.

The building is equipped with a modern type of pneumatic tube system which serves the Bank on the first mezzanine gallery and second floors. There are 20 individual stations located at various points on these floors, each of which is connected up with every other station through the central station located in the basement. There are over 8,600 running feet of three-inch by six-inch drawn brass tubing used, which enables panels about

1½ inches by 5 inches by 12 inches to be sent over the system in special leather carriers. These carriers are operated through the various tubes by vacuum, and each vacuum tube is equipped with power control devices to insure economical operation and reduce the air flow through the tubes to a minimum when a carrier is not in transit.

When the carrier arrives at a station a light announces its arrival, and this light remains burning until the carrier is removed.

One of the special features of this building is the electric underfloor duct system which is installed on all floors above the sub-basement.

This system consists of runs of three metal ducts in parallel spaced about five feet on centers with cross-over boxes and connections at various points forming a network of ducts over the entire floors. These ducts are one and one-half inches square and are used separately for telephone, light and low tension wiring. Each duct is entirely separate throughout its entire run; therefore keeping the high and low tension wires from contact with each other.

The duct system is fed from wall panel boxes which lead to the main distributing panels, thereby making it possible to carry wires from one point to any other point of the building without exposing them.

When a piece of furniture is installed, the duct is located and a hole bored into the wires pulled, a plug inserted and the telephone, light, bell, and buzzer set up without any wires being run on the walls or floor. If this instrument is discontinued the electric plug is removed and a small plug is inserted which is set flush with the floor.

This system saves the stringing of unsightly wires over a room and the ripping up of floors and walls to make the changes in wiring and location of outlets which are necessary from time to time.

Baron T. Dan

The elevator equipment consists of ten passenger elevators in batteries of two, one coin lift and one baggage lift. The passenger elevators are of the single wrap traction-geared installation, with micro-drive floor levelling device which enables the elevator to automatically bring itself to the floor level from a distance of 18 inches above or below the level. They are equipped with all the latest mechanical devices and travel at a speed of 500 feet per minute.

Among the features contributing mainly to the comfort of the customers and employees are the maintenance of suitable temperatures, adequate ventilation and illumination. Not only has good ventilation been provided for throughout the building, but in the most important parts the air supply is artificially cooled by means of a large and elaborate mechanical refrigeration plant. This cooling of the air reduces the high temperature and humidity of the hot summer months. All air is tempered by heating in the cooler months of the year and cleaned of impurities by means of either oil filters or air washers.

The general heating of the building is accomplished by hot water, which is considered the healthiest heat because the radiators can be kept to a low even temperature.

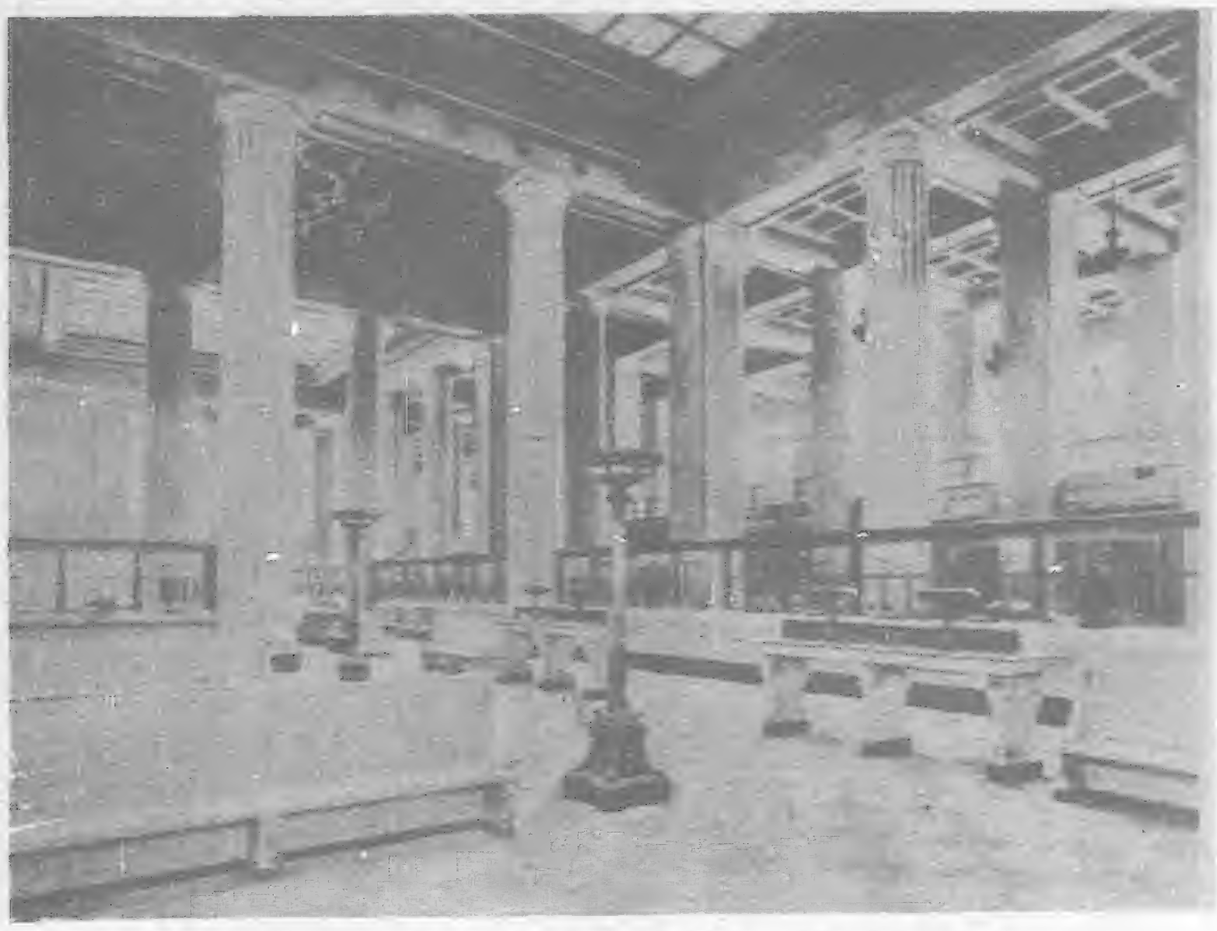
Electricity is supplied by two independent sub-stations and an emergency generating plant of sufficient capacity to supply lighting and run some of the elevators. The current from outside passes through the oil switch room and transformer room to the main switchboard, from which it is distributed to the many panel boards located on each floor of the building.

Each window, entrance and other opening is protected by automatic and manually controlled self-closing steel fire curtains, which operate on fusable links under high temperature. The large windows of the banking room and main entrance doors are also electrically controlled and operated.

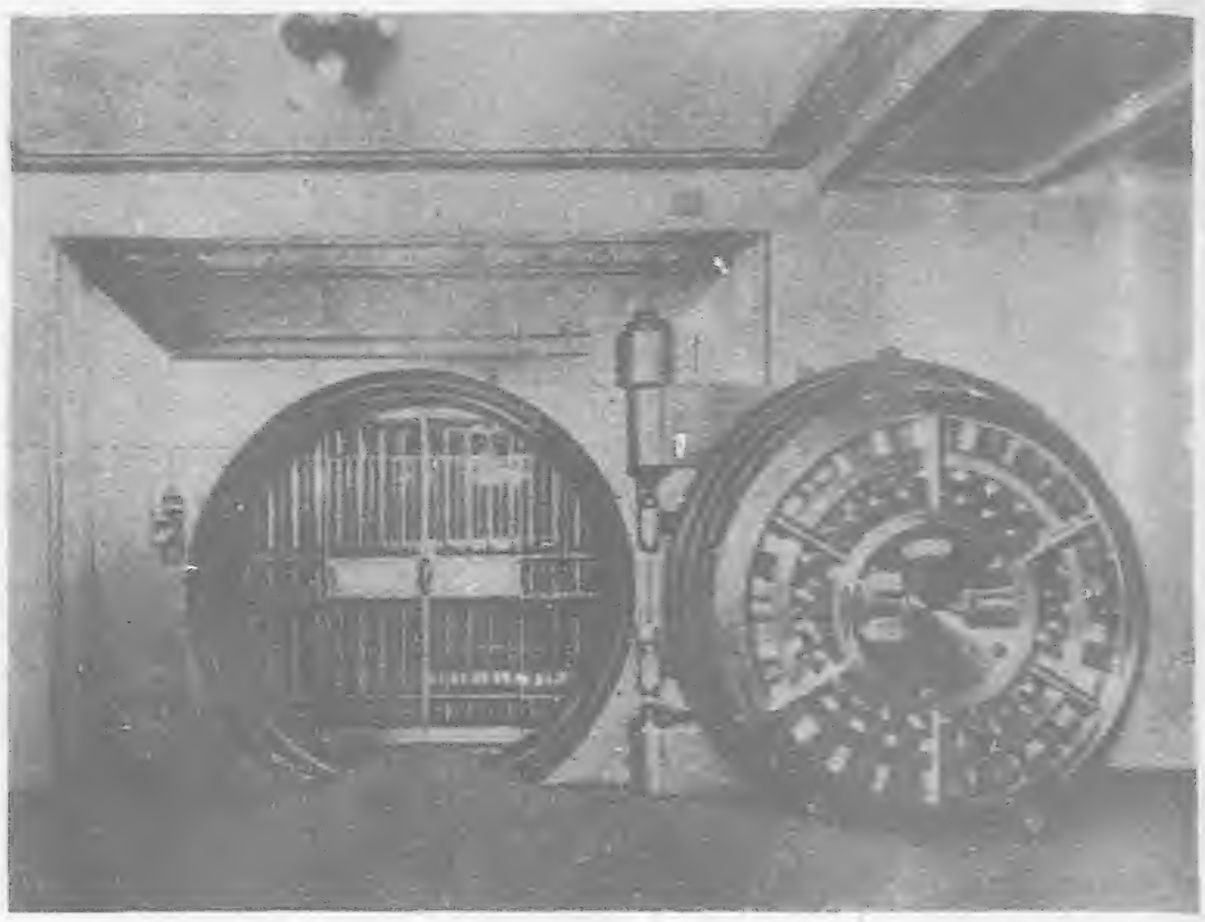
Special attention has been given to a complete fire-fighting installation. Two electric pumps and one emergency gasoline pump capable of delivering 500 gallons of water per minute have been installed. These pumps supply water to four main six-inch standpipes, located at each stair, with outlets at each floor, to which are connected 125 feet of two and one-half inch linen hose. All parts of each floor will be under the protection of these hose. Four Siamese hose connections are located outside of the building and connect up with the standpipes inside. To these the city fire department can make connection and pump water into the building.

Special electric installations of the building include public and intercommunicating telephone central stations, automatic fire alarms, watchman's supervisory clock system and electric time stamps.

A large number of rooms, such as private offices, directors', board and reception rooms, are specially designed and finished in different woods, including walnut, mahogany and English and



The Mitsui Bank, Ltd.—Head Office: Banking Room



The Mitsui Bank, Ltd.—Head Office: Security Vault Door

Japanese oak. These rooms have teakwood floors and wood or marble mantels with electric grates.

A section of the fifth floor is given over to a specially designed group of private drawing and dining rooms for use on special occasion. The kitchen of this group is fitted out with the very best type of equipment made of monel metal, electric refrigeration and electric ranges.

Series of Vaults provides Large Space for Cash and Securities

Details of construction of the Mitsui Bank are as follows: The total area of the site is 1,700 tsubo * and the area of the building 1,537 tsubo. The floor area of the sub-basement is 1,530 tsubo and contains a bank book vault for the use of the Mitsui Trust Company, a trunk vault, other book vaults, machinery rooms and water tanks.

The basement area is 1,528 tsubo, and includes two rest rooms for employees, some offices of the Trust Company, the safe deposit vault, a cash vault for the holding company, a machinery room, station for engineers and mechanics and the headquarters for the watchmen.

The main floor is 1,357 tsubo in area, divided by a partition towards one end which will separate the departments devoted respectively to the bank and the trust company. The main cash vault is also located on the main floor, which is surounded by a mezzanine and gallery.

The second floor is given over to the offices of the executives of the bank, general offices and two dining-rooms, the third floor for offices of the holding company, and the fourth floor to offices of the Mitsui Bussan and the Toshin Warehouse Company.

The fifth floor is set back slightly from the street and includes the offices of the Mitsui Mining Company, conference rooms and a dining-room. The pent house contains machinery and water tanks. The total floor area of the building is 9,577 tsubo.

All earth was removed for 25 feet below the street level and a concrete mat four feet thick placed as a foundation for the structural steel of special strength and section with all joints overlapping, and connected at the joints to horizontal stress beams. The skeleton structure alone was built to withstand earthquake shocks, regardless of the additional strength of the concrete reinforcing.

The walls were built up on lever bars anchored to the steel frame, with all floors built up over wire mesh. The total steel used amounted to 9,600 tons, half of which was imported and half supplied by the Imperial Steel Works at Yawata and fabricated by Shimidzu Gumi and the Yokogawa Bridge Company. The lever bars used amounted to 450 tons.

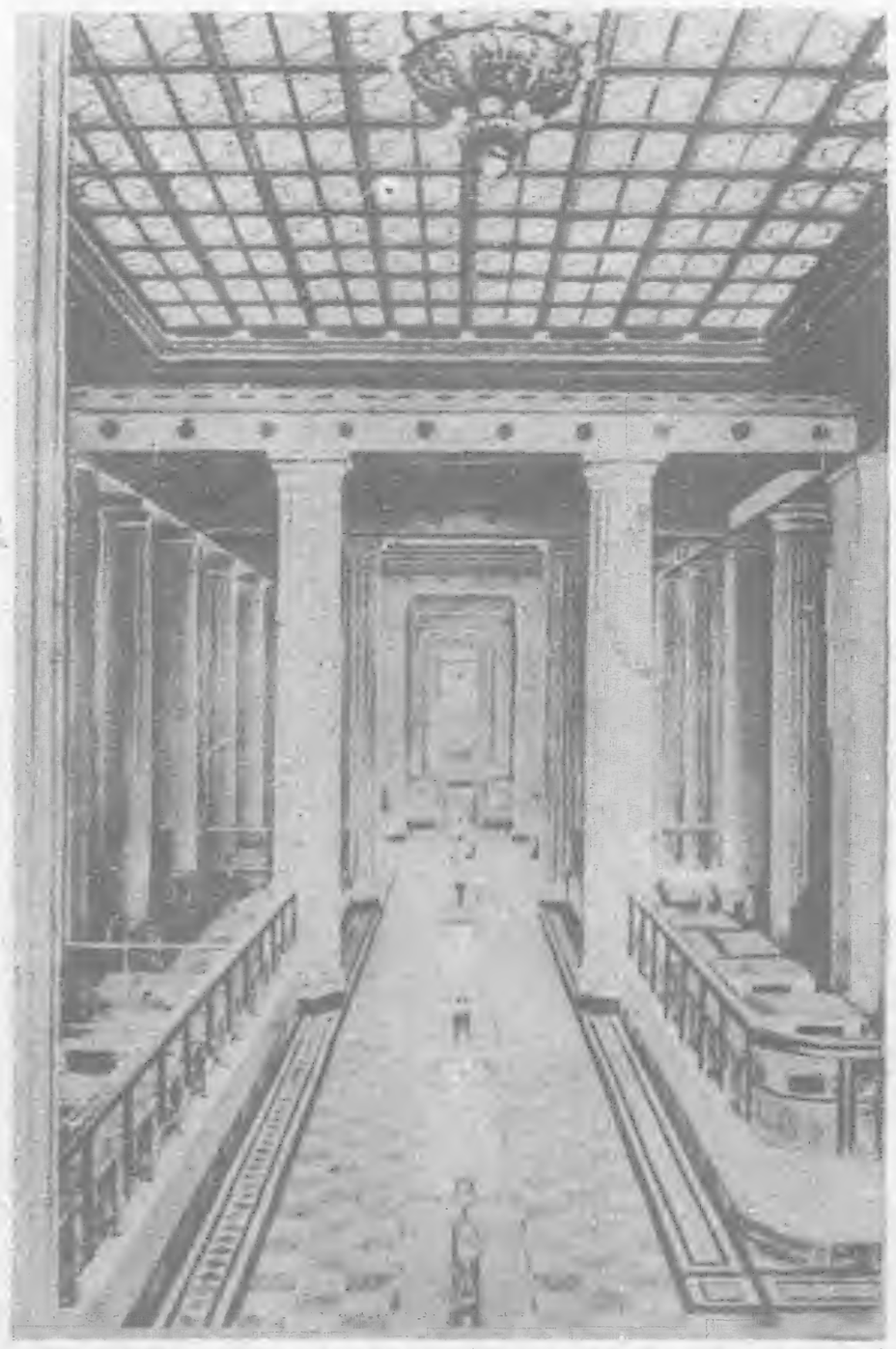
The outside finish is of Inada granite, with 22 Corinthian columns around three sides. A total of 117,000 cubic feet of this granite was used in the construction.

The ceilings are of sized plaster with Grecian ornamental designs painted in bright pigments over the banking floors and in other places in white or light color. The walls and columns of the main floor are of Italian Bottacino marble, the wainscoting and corridors using local marble in other parts of the building. The special rooms for executives and for conferences are finished in beautifully grained woods, including oak, walnut, birch, cherry, mahogany and teak, with fireplace mantels of Italian and Belgian marble and with hardwood parquet flooring. Other floors are covered with ordinary wood flooring, cork and linoleum. The sub-basement flooring has been waterproofed with a special compound which will keep out all moisture.

The mechanical equipment includes a ventilation system provided with air water sprays, oil filter, five-draught fans and nine exhaust fans which will change the air in the entire building three times an hour. Heating is by hot water radiators and air warming in the intake ventilators and around doors. The hot water is heated by steam and pumped throughout the building. Ventilation and heating extends even to the vaults. The air is cooled in summer by water spray and by passing over brine coils, while there is also a deep well which can be used for air cooling. The compressors in the system have a capacity of 140 tons of ice in 24 hours.

Water is supplied from the city mains for drinking, kitchens and washing, while water for heating, refrigeration

(*Continued on page 416*)



The Mitsui Bank, Ltd.—Head Office: Banking Room

*Approximately 4 square yards.

Development of Communications in Japan

By P. K. CONDICT, Executive Vice-President International Standard Electric Corporation

WHEN Commodore Perry landed in Japan in the year 1854, he carried among other presents for the Imperial Court a Morse telegraph instrument. Since that date, not only has there been frequent social and business intercourse between Japan and America, but also close association in the development of communication services. In the operation of the telephone service this association has perhaps been particularly notable, as many American practices have been used in the large and growing telephone network throughout the great Empire of Japan.

The first telephones to be introduced in the Empire were two magnetic telephone sets brought from America to Tokyo by a Japanese in 1877, just one year after Alexander Graham Bell's invention. These two sets were first tested over telegraph lines between Tokyo and Yokohama, and were later installed for actual service between the Imperial Household and the Department of Public Works. In 1883 a switchboard employing knife switches was installed in a Tokyo telegraph office to give telephone service between officials in the Department of Public Works.

The Minister of Public Works at that time proposed Government ownership of telephone systems, but his plans were rejected, and in 1884 a privately owned operating company was planned. A year later the promoters of this private company sent a representative to the United States to study the industry there and make a report. But before anything could be done by private initiative, the Government had reconsidered its previous decision, and decided on Government ownership and operation of the new service. This decision was reached in 1888. Since that time an enormous enterprise has developed in the telephone business in Japan. Central offices and toll lines have been constructed in the country, and Japanese factories have supplied the equipment. Many Japanese telephone engineers and manufacturing experts have visited the United States to study the practices in that country, and American assistance has been freely given and used.

Dr. Saitaro Oi, Chief Engineer of the Telephone and Telegraph Department of the Japanese Government

Dr. Saitaro Oi, the first chief engineer of the Telephone and Telegraph Department of the Japanese Government, visited the United States in the year 1888. Here he studied for his Government the possibilities of the comparatively new telephone invention, and it is largely the result of his foresight that Japan is indebted to-day for the sound policies on which the foundations of her telephone system were laid. Dr. Oi is often referred to as *the Father of Telephone Development in Japan*. He returned to Tokyo from his trip abroad in 1889, bringing with him the first Western Electric switchboard equipment to be used in Japan, a 100-line magneto and three 240-line series multiple boards. Some years after his retirement from Government service, Dr. Oi rendered valuable services as a director of the Nippon Electric Company, Limited, from 1919 until his death in 1926.

At the actual start of Government telephone operations in 1890 three 100-line non-multiple magneto switchboards were installed in the first telephone exchange in Tokyo, and the system comprised about 200 subscribers. Series multiple switchboards were first used in 1893. By 1895 the number of subscribers in the Empire had increased to 3,000; in 1910 to over 100,000; in 1923 to 416,000; and to-day there are 600,000 subscribers. These figures do not include over 100,000 special subscribers living in small towns and villages throughout the Empire and who, by special arrangement with the Government, own their own telephone lines and telephone sets, and receive service through switchboards owned and operated by the Government. The first toll line in Japan was constructed in the year 1890 for telephone service between Tokyo and Yokohama, a distance of 18 miles. In 1897 telephone cable was first used with 25, 50, and 100 pairs of conductors manufactured by the Western Electric Company in Chicago. In 1899 telephone toll lines were constructed between Tokyo and Osaka, a distance of about 380 miles. Since then the extension of toll lines throughout the Empire has been rapid.

Toll cables were first used in 1922, the jobs being engineered and supplied by the International Western Electric Company and the Nippon Electric Company, Limited, for service between Tokyo and Yokohama, and also between Kobe and Osaka, a distance of 20 miles. In this same year our engineers cooperated with the engineers of the Japanese Government in surveying a route for a toll cable to be laid between Tokyo and Osaka, to provide the facilities needed for the rapidly growing demand for more extensive telephone service. The first 60 miles of this cable was manufactured by the Western Electric Company at Hawthorne, and practically all of the balance of the cable has been manufactured by our associated company, the Sumitomo Electric Wire & Cable Works, of Osaka. Loading coils and repeaters have been furnished by the Nippon Electric Company, Limited, and it is expected the entire project will be completed in the very near future.

This steady development of the telephone service in Japan was very greatly retarded by the appalling earthquake which largely destroyed the cities of Tokyo and Yokohama on September 1, 1923. Of the 19 telephone offices in the great capital city of Tokyo only six were in service after the earthquake, and no telephone facilities remained in Yokohama. As so much of these two great cities had been destroyed by fires which followed the earthquake, there was no immediate need for the telephone service which had previously existed. The Government, therefore, very wisely decided that as time was allowed, and as almost entire rebuilding of the systems of the two cities was required, it would be desirable to adopt automatic telephones rather than the manual telephones such as had been in service prior to the earthquake.

The automatic lines now in service in Tokyo and Yokohama have considerably more than replaced the losses due to the earthquake, and, in addition, many thousands of automatic lines have been put into service in the cities of Osaka, Kyoto, Kobe and Nagoya.

The connection of the International Standard Electric Corporation with the telephone development in Japan has been very

One of the New Buildings of the Nippon Electric Company, Ltd.

close and cordial. Mr. K. Iwadare, the present chairman of the Nippon Electric Company, Limited, was appointed agent of the Western Electric Company for Japan in 1895, and through him considerable telephone equipment has been furnished to the Japanese Government. Mr. H. B. Thayer visted Japan in 1897 in order to meet personally the agent of his company. During his visit arrangements were made to form our associated company, the Nippon Electric Company, Limited, which was incorporated under the laws of Japan in 1899, and was the first company to be chartered under the revised commercial code which allowed foreign participation in Japanese companies. From our own business point of view this agreement or treaty to form our associated company in Tokyo in cooperation with our Japanese friends has been as significant as the great Treaty signed by the Japanese with Commodore Perry.

Shortly after its incorporation the Nippon Electric Company, Limited, purchased an old electric motor factory, together with the ground on which these buildings were located. The buildings provided 28,000 square feet of floor space, in which the new company started its career, and included in the equipment was a small power plant and 75 machines, the greater part of which were lathes. The growth of the company has been steady and conservatively directed. It has gradually undertaken the manufacture of new lines of communication equipment, and its most recent advance is the complete manufacture of automatic telephone apparatus. New buildings have been constantly provided to care for growth, and the latest types of machines are always in use. During its entire life the Company has taken particular care in testing and inspecting the equipment which it manufactures, putting forth all efforts to maintain the highest possible quality of product.

The Nippon Electric Company, Limited, now has capital stock outstanding to the amount of $8,250,000 fully paid. It is using 317,000 square feet of floor space in its own buildings, with additional new buildings under construction. This is 23,000 square feet more space than the Company was using prior to the earthquake. The new buildings which have been constructed by the Company since the earthquake are steel frame and embody the best idea of both Japanese and American architects and engineers. They are designed to withstand earthquakes of even greater force than that of 1923.

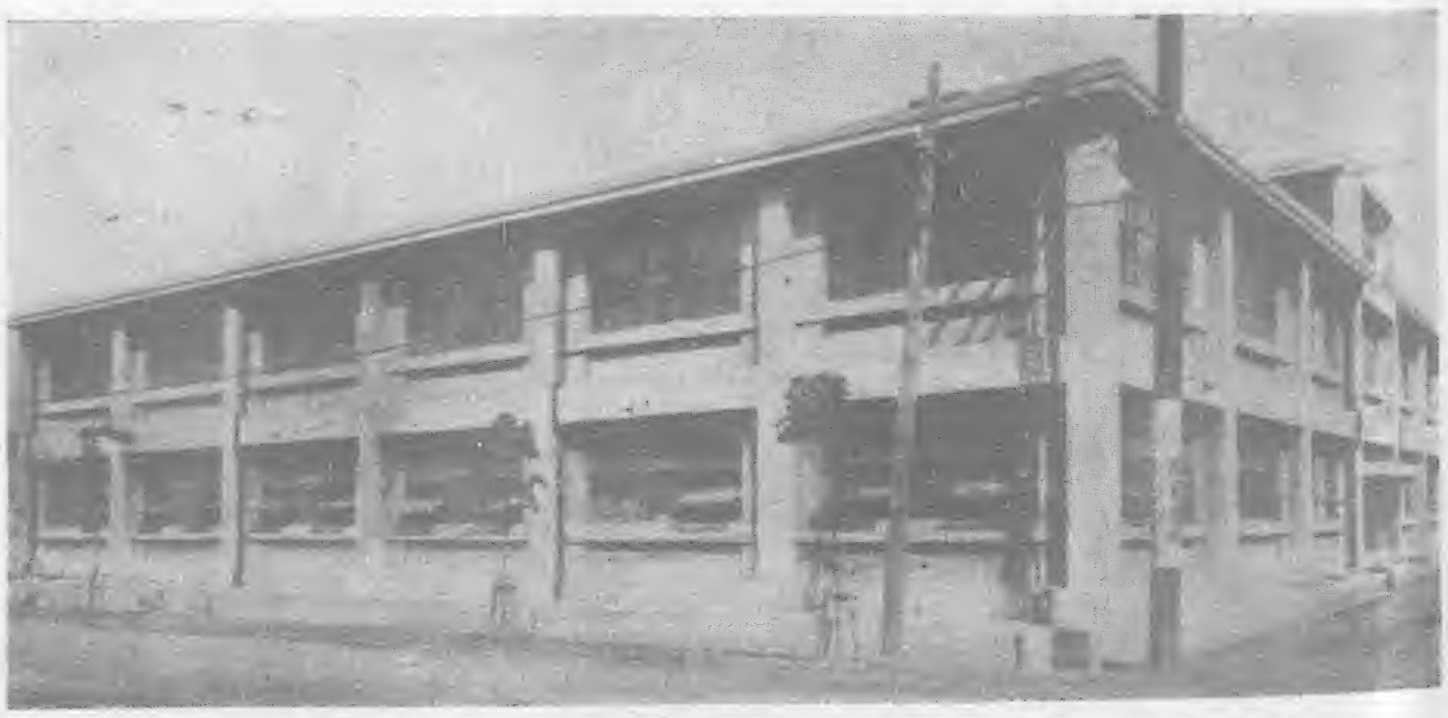
Mr. K. Iwadare, Chairman of the Nippon Electric Company, Ltd.

The earthquake of 1923 caused great loss to the Nippon Electric Company, Limited. In addition to the appalling loss of life of employees (there were 100 killed and many injured), much equipment was damaged or destroyed, and more than one-half of the floor space was rendered useless. The Company made a remarkably quick and brilliant recovery from this staggering disaster ; the ruins of the old buildings had been cleared away and some manufacture started 60 days after the earthquake, and steps were taken at once for rebuilding structures which had been destroyed or badly damaged.

In the year 1920 we made a most important association with the great house of Sumitomo through the Nippon Electric Company, Limited. At that time an agreement was made to form the Sumitomo Electric Wire & Cable Works, taking over the wire and cable business which had been formerly conducted as a department of the Sumitomo Company. The Nippon Electric Company, Limited, became financially interested in this enterprise, and it was agreed that all of our patents and information relating to the manufacture of toll cable and wires should be made available through this new company. This association has been a most happy one, both for our own company as well as for our associated companies. Telephone toll cable of the highest quality has been manufactured in Japan by the Sumitomo Company, and it has also continued to develop its business in the manufacture of other types of telephone and power cables and wires.

Through the foresight, energy and development work initiated by the Sumitomo Electric Wire & Cable Works, this company should continue to grow and to perform its important functions in the great Empire which it is serving, as well as in China.

Although telephone development in Japan has not been as rapid as in some other countries, there has been, nevertheless, a steady and sound growth. The administration is keeping abreast of modern developments in the telephone, the telegraph and wireless. The manufacturers of equipment have kept pace with the developments and, generally speaking, there are ample facilities in the country to supply the administration's requirements of apparatus, cable and wire. Japan, in the near future, will be even more closely and fully connected with her neighbors, to the east and to the west, in that association of nations which is daily being brought into more friendly and intimate connection through the peaceful medium of the telephone, the cable and wireless.



Factory and Warehouse of the Nippon Electric Company, Ltd.

Report on the Pan-Hsi Antimony Mine, Yi-Yang, Hunan

(Summary)

By C. C. TIEN, S. Y. KUO and H. C. WANG

THE Pan-Hsi Antimony Mine, which is one of the most important mines of its kind in Hunan, is situated 135 *li* south-west of the city of Yi-Yang Hsien. The mine is very inconveniently located so far as transportation facilities are concerned, connection being made by water and a light railway with Changsha, which is more than 100 miles from the mine

The mine was first operated in the end of the Ching dynasty by the Hunan Provincial Mining Board without good results. From 1900 to the Great War the operating company underwent several reorganizations. In the course of the Great World War, as antimony was greatly needed and the Company was very prosperous, modern mining practice was introduced in place of old methods, and a light railway between the mine and Wan-San-Chou was built. In 1920, however, the mine stopped operations because of the sudden drop of antimony prices immediately after the close of the Great War, resulting in a heavy loss of money. In 1924 the mine was reopened under a new company by the name of Weiyi-Chiutung. Furnaces were then built, and the work of mining and smelting went on continuously and successfully.

Topography and Geology

The Pan-Hsi antimony field exhibits a very rugged surface, with innumerable hills and ridges projecting above deep valleys. The hills mostly rise to a height of about 700-800 meters and often show precipitous peaks and cliffs. Among the valleys in the mining region the largest and deepest is Pan-Hsi, which runs out from Tsang-Hsi-Ling and thence extends in a general direction of N.N.-E to meet with Chan-Hsi, about 60 *li* N.N.-E of the mine. It is along this valley that a light railway was built by the Company from the mine to Wan-San-Chou, about 20 *li* .long. The great features of the landscape have a general trend of N.E,-E-S,.W.W, following the strike of sedimentary rocks.

In the mining region the bedrock is built exclusively of sedimentary rocks, probably Ordovician in age. As shown in the Pan Hsi vicinity they are chiefly represented by slate, phyllitic sandy shale and phyllite, folded along the chief tectonic axis of N.-E.E-S.-W.W into a series of anticlines and cynclines, the slopes of which dip some 60°–70°.

Ore Deposit

DISTRIBUTION.—The distribution of the antimony deposits in the mining region may be divided into the following groups or ridges :

(1) Hei-Wang-Tze ridge.
(2) Wan-Chia-Shan ridge, with its extension, Su-Shih-Lung.
(3) Hsu-Ku-An ridge.

At present the mining places are confined to the first two ridges.

MINERAL ASSOCIATION.—The ore minerals belong, as far as we have found, exclusively to the primary sulphides of antimony, viz. stibnite, the secondary oxides as valentinite or cervantite, which are not infrequently found in the Ch'ang-Lung-Hua antimony mining field of Hsi-Kuan-Shan, Hsin-Hua, being entirely absent here. Stibnite chiefly occurs either as very small acicular crystals or as medium-grained masses interlocked with quartz. Besides, it also sometimes occurs as veinlets cutting through the quartz. The latter is the only gangue mineral, generally occurring as white to grayish-white densive masses ; its crystals have so far not been found. Except some pyrites that occur as small grains scattered in the quartz, no other associated minerals, such as gold and cinnabar, have so far been observed.

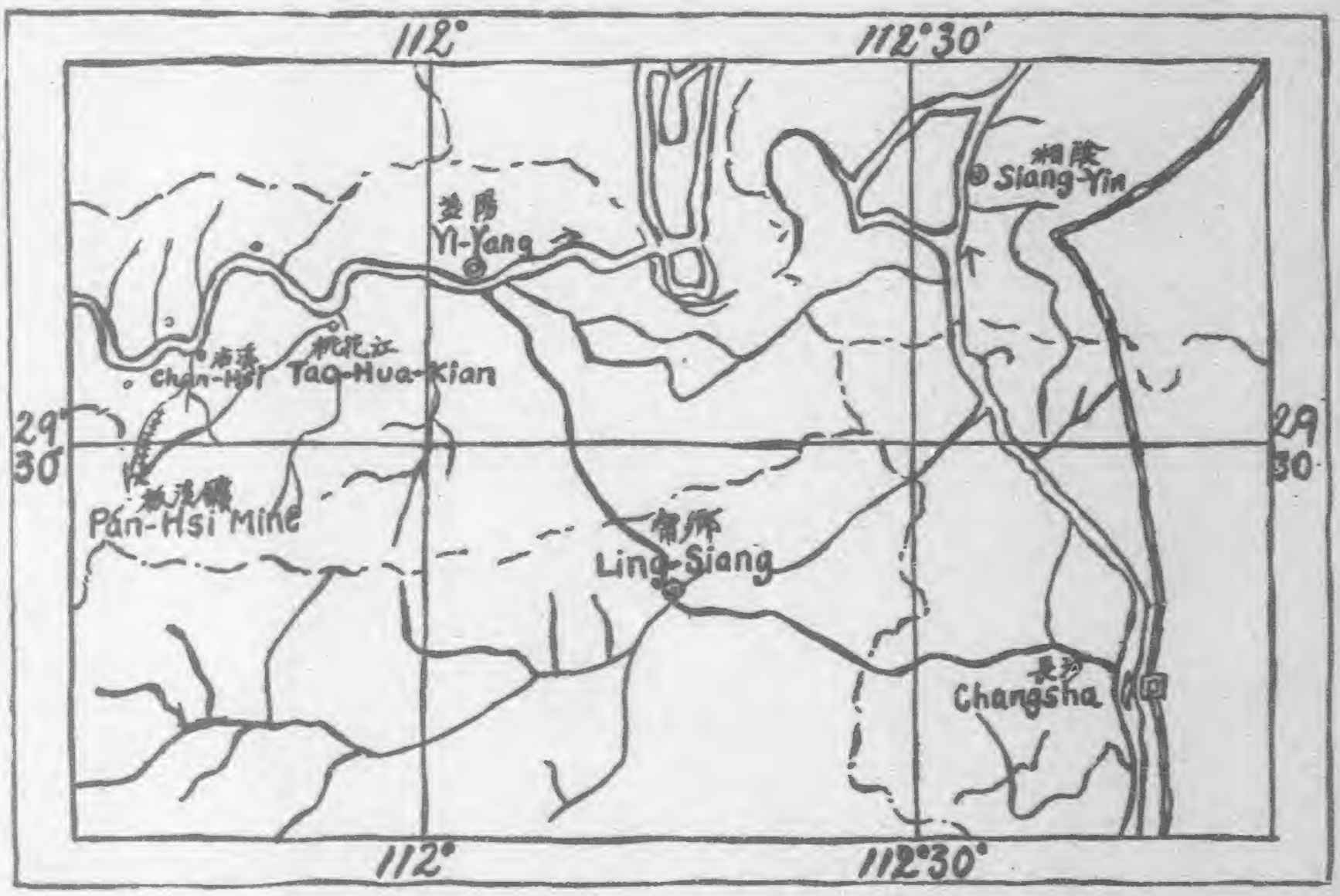


Fig. 1.—Map Showing the Location of the Pan-Hsi Mine. Scale 1: 850,000

OCCURRENCE AND ORIGIN.—The ore deposits, as already mentioned, all occur in the form of well-defined veins and are practically confined to the folding part of the slaty or phyllitic shales and phyllites. Up to the present time two main ore veins, called Hsi-Pei-Mei and Tung-Hsi-Mei respectively, have been discovered. Hsi-Pei-Mei is about 2,000 feet long by 1-20 feet wide, trending N. 54°–36° E. with a general dip toward N.W. at an angle of 45°–75°. Tung-Hsi-Mei is about 1,600 feet long by O. 5-5 feet wide, running N. 41°–64° E., with a general dip also toward N.W., but at an angle ranging from 60° to 90°. The distance between the two veins is about 1,500 feet apart. They both have been mined in many places downward to a depth of 300 feet and have produced as a total not less than 22,000 tons of antimony, equal to about 140,000 tons of raw ore. In general, the ore mined from Tung-Hsi-Mei is

better in quality than that from Hsi-Pei-Mei. (In average, the former contains about 25 per cent. and the latter about 20 per cent. of antimony).

Some facts regarding the origin of the deposits may be noted as follows :

1. The country rocks such as phyllites or phyllitic shales near the contact with the ore veins often show the appearance of talc.

2. The ore stibnite also occasionally occurs as small grains scattered in the small quartz veins which cut through the said country rocks sometimes in form of veinlets.

3. The ore stibnite generally occupies the inner and lower part, while the gangue quartz occupies the outer and upper part of the veins.

In view of these named respects, the antimony deposits of the Pan-Hsi mining field cannot be taken only as fissure filling, as A. S. Wheler and others have pointed out. However, it seems very likely that the deposits in question may be connected to the granite or pegmatite granite activity occurring at Chuan-Tien-Ou, which probably took place accompanying the tectonic movements of the later Cretaceous or the early Tertiary.

Ore Reserve.—The total quantity of ore in the two main veins amounts to about 172,000 tons of antimony, equal to about 1,070,000 tons of raw ore. Of the 172,000 tons, only about 22,000 tons of pure metal, equal to about 140,000 tons of ore, have been removed, leaving about 150,000 tons of metal for future exploitation.

Mining

The mine has thus far three tunnels, named Tung-Hsi-Tao, Ju-Sha-Tao and Ju-Shan-Tao, and two shafts, of which one is vertical, called Tung-Ta, and the other inclined, called Li-Ta (Fig 2). Tung-Hsi-Tao, laid out for exploiting the ores of Wan-Chia-Shan and A-Po-Keng, is located 120 feet higher than Ju-Sha-Tao, which is the short cut for extracting the ores of Hei-Wang-Tze. Ju-Shan-Tao is now being driven by compressed air drills for the purpose of connecting Ju-Sha-Tao to Tung-Hsi-Tao, and will be finished in a short time. It is of prime importance to the whole mine in regard to ventilation, pumping and underground transportation. Hence its position is very low, being about 100 feet lower than Ju-Sha-Tao, Between Ju-Sha-Tao and Ju-Shan-Tao there lies the vertical shaft which will be the main outlet of ores after connections of the tunnels shall have been made. The inclined shaft is located at the summit of A-Po-Keng, about 300 feet higher than Tung-Hsi-Tao, serving as a ventilation winze. Below Ju-Sha-Tao there are three levels, namely 1st, 2nd, and 3rd, at depths of 100, 200, and 300 feet respectively. Midway between Ju-Sha-Tao and the first level, and between the levels themselves, sub-levels have been driven which are connected to the levels by inclined raises and winzes. There are four sub-levels.

The ore is mined by open stoping. Drilling is entirely done by hand. Timber is little used, most of it being fir-wood. In 1927 the total cost of timber amounted to about $27,000. Two kinds of explosives, imported and native, are used there, the latter consisting of 75 per cent. potassium nitrate, 15 per cent. charcoal, and 10 per cent. sulphur, but used only in a very small amount. In 1927 more than $18,000 was paid for the imported explosive and about $170 for the native one ; hence the annual consumption of the former is over ten times that of the latter. One or two drill holes, which is about the work done by a miner in an eight-hour shift, is fired at the same time, producing 80 to 100 catties of raw ore. As a rule, ores coming from Tung-Hsi-Tao are better in grade than those from Ju-Sha-Tao and Ju-Shan-Tao, though Ju-Shan Tao yields the greatest production. In all the levels and tunnels a 16-lb. rail track was laid or built. The ore mined in the stopes is loaded by shovelling into baskets, which are carried on shoulders to the tunnels, where it is transferred into cars and then pushed out. Daily production of raw ore reaches 30 to 40 tons.

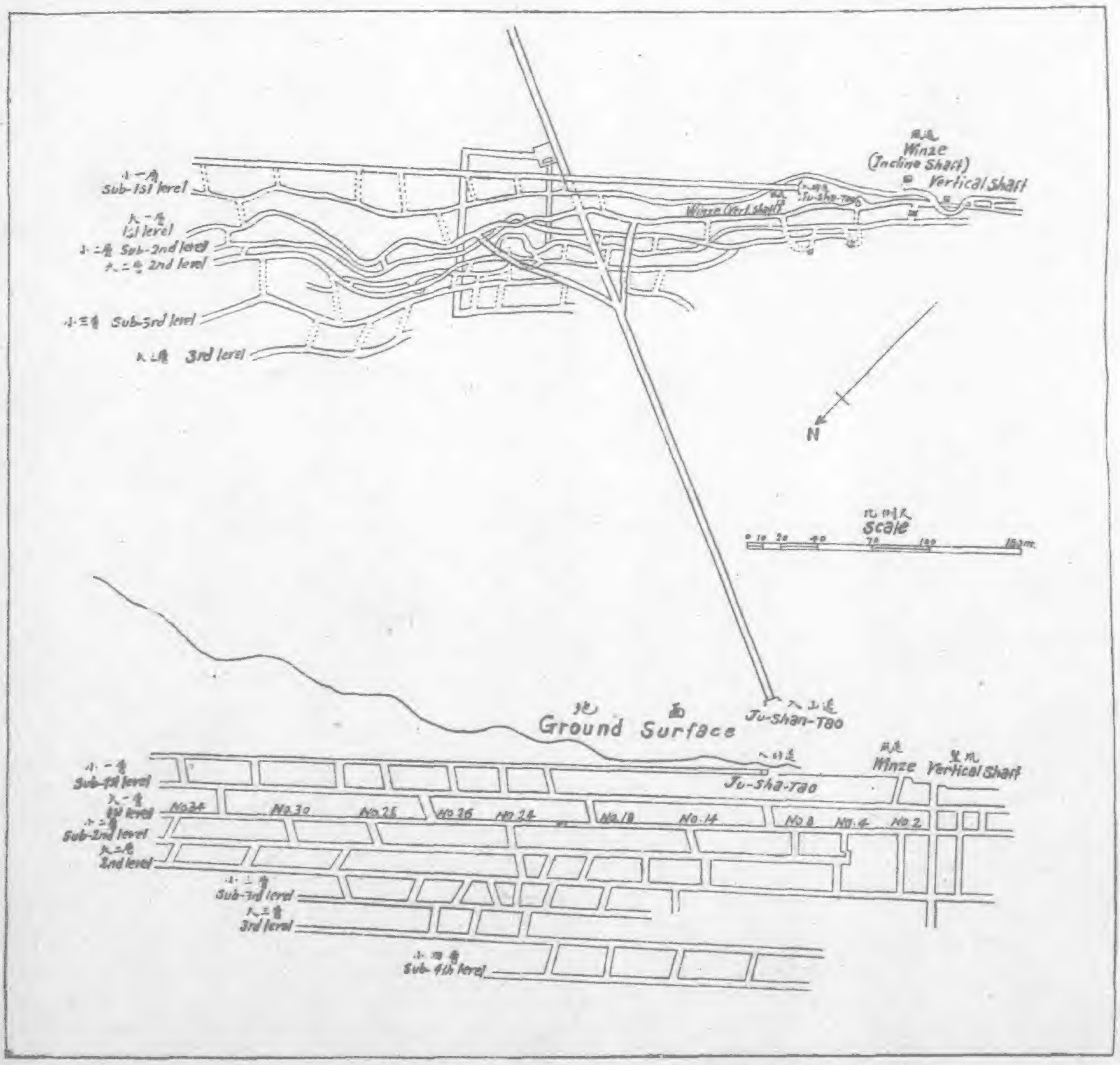


Fig. 2.—Under-Ground Plan and Profile of Pan Hsi Antimony Mine.

Ventilation is conducted by natural draft, Li-Ta shaft serving as the up or down cast of the whole mine. Underground reservoirs were constructed in the second level, wherefrom water is pumped to the surface by two steam pumps.

Formerly underground workings were lighted by electricity, but on account of the frequency of breaking lamps through the carelessness of the miners a kind of native oil called "Cha-Yu" is now used instead.

Smelting

The metallurgical process consists of two successive steps, *i.e.*, the preparation of volatile antimony trioxide and the extraction of antimony from the trioxide.

In the first step, antimony trioxide is prepared by the Herrenschmidt process. The plant (see Fig. 3) employed for this process

comprises two furnaces in which the oxidizing roasting is carried on, five collecting chambers, one fan, and finally a series of wooden collecting chambers.

The furnace (*a* or *a'*) is a square shaft of fire brick with a step grate of 12 iron bars (*b*), arranged as shown, and with an opening on the top for receiving charges, and another one on the front, near the top, to which is fitted a pipe (*c*) for conducting the gases to the condensing and collecting system.

The condensing apparatus consists of two transverse chambers (*d* and *e*), and three longitudinal chambers (*f*, *g*, and *h*) of which the last two are set over with eight inverted, V-shaped tubes, as illustrated. At the end of these chambers is a fan (*i*), which is rotated by an electric motor to draw the gases through the system and force them through the underground flue into the last collecting chambers. Moreover, the air takes the chance to enter the furnace much more easily as soon as the fan is set in motion.

As for the operation, the ore coming from the mine is transported to a shed beside the plant, where it is hammered to from 1 inch to 2 inches in size, from which the dust and fine particles are separated by shifting. This is all done by laborers. The broken ore is then carried to the charging platform of the furnace. Seven hundred pounds of it is charged each time into the furnaces (*a* and *a'*), mixed with 8 per cent. charcoal and 6 per cent. coke.

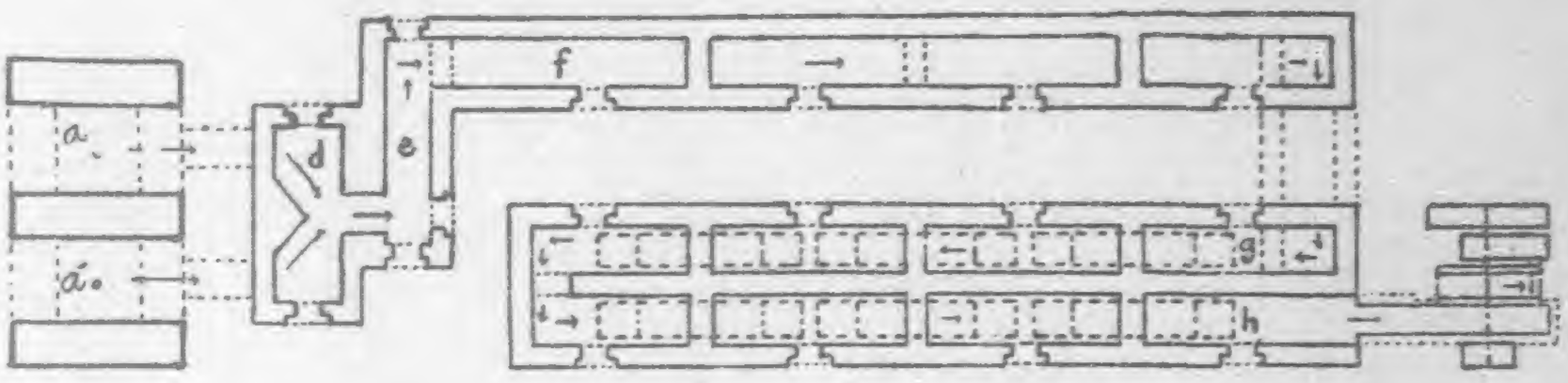


Fig. 3.—Diagram of Smelting Plant. Scale 1: 160

The atmosphere in the furnace is not excessively oxidizing, due to the carbon in the fuel, hence the antimony sulphide is oxidized to trioxide, S_2O_3, and not to tetroxide, S_2O_4. The trioxide volatilizes and passes out of the furnace together with the gases from the fuel through the pipe (*c*) to the condensing and collecting chambers (*d*, *e*, and *f*) in an up and down way. The oxide which is collected in these chambers, as the temperature falls, is generally contaminated with about 25 per cent. of impurities, chiefly dust from the ore and ashes from the fuel in the furnace. From these chambers the gases traverse successively the inverted V-shaped tubes and chambers (*g* and *h*) in an up and down manner, where the oxide is condensed and deposited in a pure form. Finally the gases enter the fan (*i*) and are forced through the underground flue into the series of wooden chambers, where the last portion of the oxide is collected.

About an hour and a half after the first charge has been made, oxidation, condensation, and deposition are successively completed and another charge is made. Hence in 24 hours 16 charges may be made, that is, 5 tons of raw ore can be roasted in two furnaces. The antimony trioxide thus obtained in the collecting chambers and flue amounts to 1.15 tons, of which 0.5 ton is pure and called the " white oxide." There are 12 furnaces in operation, so that 6.9 tons of antimony trioxide can be obtained from 30 tons of raw ore every 24 hours, and 3 tons of the oxide is relatively pure and may be sold separately without further treatment.

In the second step, the remaining part of the oxide, which is not so pure, amounting to 3.9 tons, is smelted and reduced for the extraction of metallic antimony. The plant (see fig. 4) consists of a reverberatory furnace with natural draft, *a* being the fire, box, *b* the grate of 30 iron bars, *c* the hearth, and *d* the flue.

About one ton of antimony oxide is charged into the furnace, at one time mixed with 20 per cent. charcoal and 4 per cent. sodium carbonate, charcoal being the reducing agent and soda the flux. The fuel used is bituminous coal and pinewood. As soon as the flame enters the furnace it reflects from the arched roof to the charge, which then becomes melted. The charcoal reduces the oxide to metallic antimony in a molten condition settling to the bottom with evolution of carbon dioxide, while the soda fluxes the gangue to form a very fusible slag floating on top, which not only protects the molten antimony from being re-oxidized and refines it by dissolving any sulphide of antimony and of foreign metals left in the oxide, but also prevents the volatilization of the oxides. In the meantime carbon dioxide passes out of the furnace together with a small amount of volatilized oxide.

About 12 hours after charging, reduction is completed and the workmen open the doors, skim off the slag, and put a proper amount (about 10 per cent. of the original weight) of fresh soda and white oxide on to the melting antimony before it is poured into iron molds. Since the antimony is covered with a coating of soda and oxide, there is time for it to crystallize slowly, presenting a characteristic fern-like pattern, called a " star." A distinct and well-formed " star " is generally considered to be an indication of the purity of the metal.

On an average, 0.7 ton of metallic antimony can be extracted from one ton of oxide. Since two charges can be made in 24 hours, the metal produced in one furnace is therefore 1.4 tons. As there are two furnaces in operation, so the total daily production is 2.8 tons of metallic antimony extracted from 4 tons of oxide. The metal thus produced is commercially called "Antimony Regulus."

As 5 tons of ore gives 1.15 tons of oxid (Sb_2O_3), the ore contains 19.16 per cent. antimony when loss is not figured. On the other hand, 1 ton of oxide gives only 0.7 ton of metallic antimony, so the percentage of the latter in the ore should be reduced to 16.12. It is evident that 3.04 (19.16—16.12) per cent. of the metal is entirely lost during the second step. If the loss during the first step of roasting is also taken into consideration, the total loss would probably reach 6 or 7 per cent., that is, 6 or 7 tons of metallic antimony are lost for every 100 tons of raw ore smelted. At least one ton of metallic antimony may be produced from 5.5 tons of raw ore if the metallurgical process is well manipulated.

Mechanical Equipment

The mine is equipped with a boiler-house, a power-house, a smelting plant and a workshop. The boiler plant consists of two 150-h.p. Heine water-tube boilers, of which only one is kept running all the time. Bituminous coal serves as fuel. The monthly consumption of coal in 1927 averaged about 120 tons. The power-house is equipped with an air compressor and an electric generator ; the former supplies power to the compressed air drills used in the drilling of Ju-Shan-Tao, and the latter supplies electricity to the motors in the smelting plant and the workshop and for lighting as well. In the smelting plant are built sixteen shaft furnaces for oxidizing roasting, with only twelve running at one time, and four reverberatory furnaces for reducing smelting, with only two running at one time. Both kinds of these furnaces are constructed with natural draft ; their operations have already been briefly described. The workshop is equipped with a set of mechanical appliances such as lathe, drilling machine, planer, grinder, drill-press, etc., most of them being driven by electric motors.

Transportation

There are five loading stations at Ju-Shan-Tao-Wan-San-Chou, Chan-Hsi, Tao-Hua-Kiang and Yi-Yang respectively, for the transportation of mine products and supplies. Among them Ju-Shan-Tao is the center of distribution for the products from and supplies to the different parts of the mine, materials being carried by coolies at a cost of about $0.20 per ton. From Ju-Shan-Tao to Wan-San-Chou a 24-lb. rail track has been built on which wagons are pushed by men at a cost of about $1.00 per ton. On the return trip coal and general supplies are brought back. When the load reaches Wan-San-Chou it is tipped from the truck, shovelled into baskets and carried down the river bank by coolies to Chinese junks, which sail for Chan-Hsi; bamboo or timber rafts are used instead of junks during low water. The transportation cost from Wan-San-Chou to Chan-Hsi amounts to $1.70 per ton. Between Chan-Hsi and Changsha junks are available throughout the whole year, these being towed by steam-boats. The portage for this part averages $3.60 per ton. If steam-boats are available at Yi-Yang, transportation from Chan-Hsi to Changsha costs only $2.60 per ton. Thus the total cost of transportation from the mine to Changsha ranges from $5.50 to $6.50 per ton.

Production and Operating Expenses

More than 30 tons of raw ore are produced daily, from which 3 tons of white oxide and 2.8 tons of regulus may be extracted, the annual production reaching about 1,000 tons each. The following table shows the yearly productions from 1925 to 1927 of raw ore, white oxide, and regulus, and the cost per ton of each in production:

Fig. 4.—Diagram of Reverberatory Furnace.
Scale 1: 60

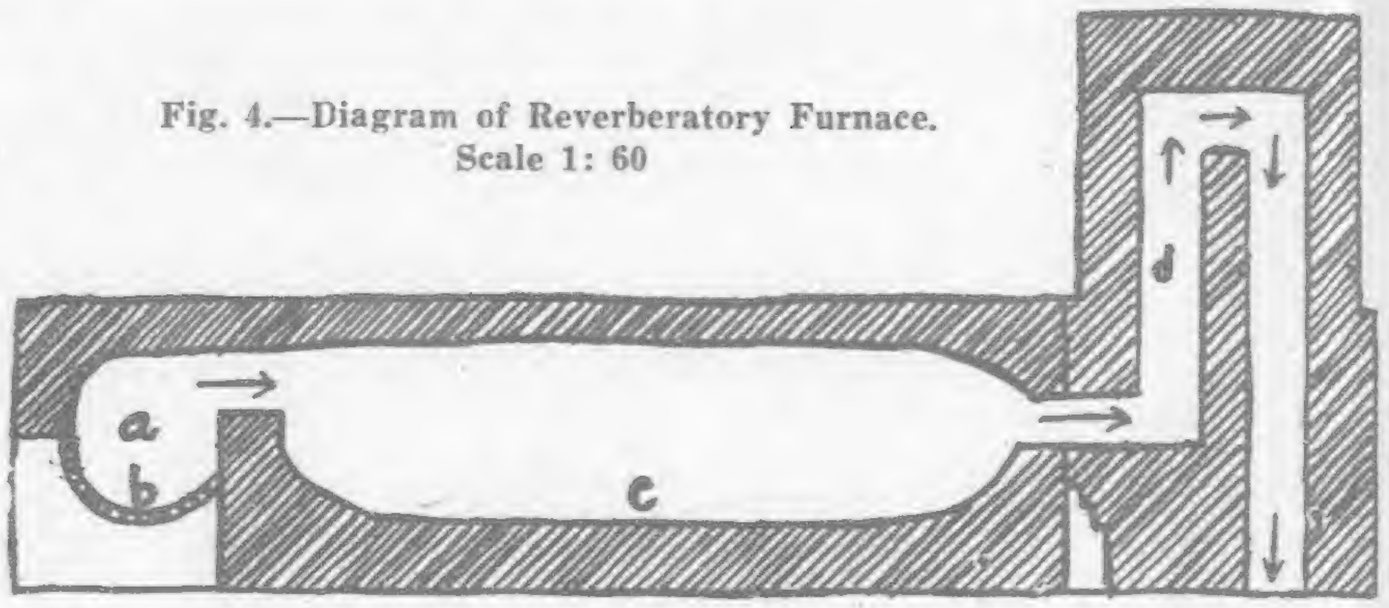


TABLE OF ANNUAL PRODUCTION AND COST PER TON, 1925-1927

Year	Raw Ore. Tons	White Oxide. Tons	Regulus. Tons	Cost per ton: Raw Ore	White Oxide	Regulus
1925 ...	—	—	700	—	—	—
1926 ...	6,747	531	699	$33.00	$180.00	$287.00
1927 ...	10,346	849	834	37.00	197.00	310.00

The distribution of the operating expenses during the second half year of 1927 is also shown in the following table:—

DISTRIBUTION OF OPERATING EXPENSES DURING SECOND YEAR OF 1927

	July	August	Sept.	Oct.	Nov.	Dec.	Total
Salaries	$ 706	717	798	798	798	798	4,615
Wages	25,979	26,427	29,719	33,585	32,692	33,013	181,415
Supplies	10,620	12,126	13,685	14,485	13,048	16,013	79,977
Transportation ...	3,731	4,035	4,133	5,806	3,681	5,042	26,428
Smelting	1,033	971	1,204	1,249	1,355	1,652	7,464
Mech. Engineering ...	910	519	510	502	485	520	3,446
Total	47,463	46,923	54,861	59,362	55,375	61,320	325,354

Electric Passenger Locomotives for India

AN important contract for twenty-one 2,160-h.p. electric locomotives for express passenger service on the Great Indian Peninsula Railway has been placed with the Metropolitan-Vickers Company.

The award of the contract is the result of an interesting competition. After consideration of many different designs, both British and foreign, the G.I.P. Railway ordered three sample locomotives from different manufacturers, designed to the specifications of Messrs. Merx and Partners, who are the consulting engineers for the electrification scheme. All three locomotives were delivered and put into service during the past year, and it is as a result of extensive trials and tests under service conditions that the present bulk contract has been placed.

The locomotives now ordered are to be similar to the Metrovick sample locomotive submitted, which is shown in the accompanying photograph in service on the G.I.P. Railway.

The design presents many interesting features, especially with regard to obtained stability at high speeds. The construction is of the 4—6—2 type, consisting of three driving axels, one four-wheel bogie truck and one two-wheel pony axle, working in conjunction with the nearest driving axle, so as to form virtually a four-wheel truck. The weight of the locomotive is about 100 tons, of which about 60 tons is adhesive weight. In order that as little dead weight as possible shall be carried on the axels, the motors and their gearing are rigidly mounted on the frame of the locomotive and transmit the power to the driving axles through a universal motion flexible link drive which accommodates the route of movement between the axles and frame of the locomotive. All the weight is thus spring borne and the centre of gravity is comparatively high so that the truck is relieved from shocks. The normal maximum service speed will not exceed 75 miles per hour, but all parts are designed for a speed of 85 miles per hour to provide the necessary margin of safety.

Metropolitan-Vickers Locomotives designed by Messrs. Merx and Partners.

The electrical equipment includes six 360-h.p. motors and electro-pneumatic control gear. The pneumatically operated switches are arrayed in a high tension chamber, those for the line and main resistances being of the single unit type arrayed in groups, and those for the motor combinations and reversing being of the cam group type. The units of the control gear are easily replaceable, and, together with many of the auxiliaries, are to a large extent interchangeable with the corresponding parts of the Metrovick 2,600-h.p. freight locomotives which are in use on the railway. It will be remembered that a contract for forty-one locomotives of the latter type was placed with the Metropolitan-Vickers Company some time ago.

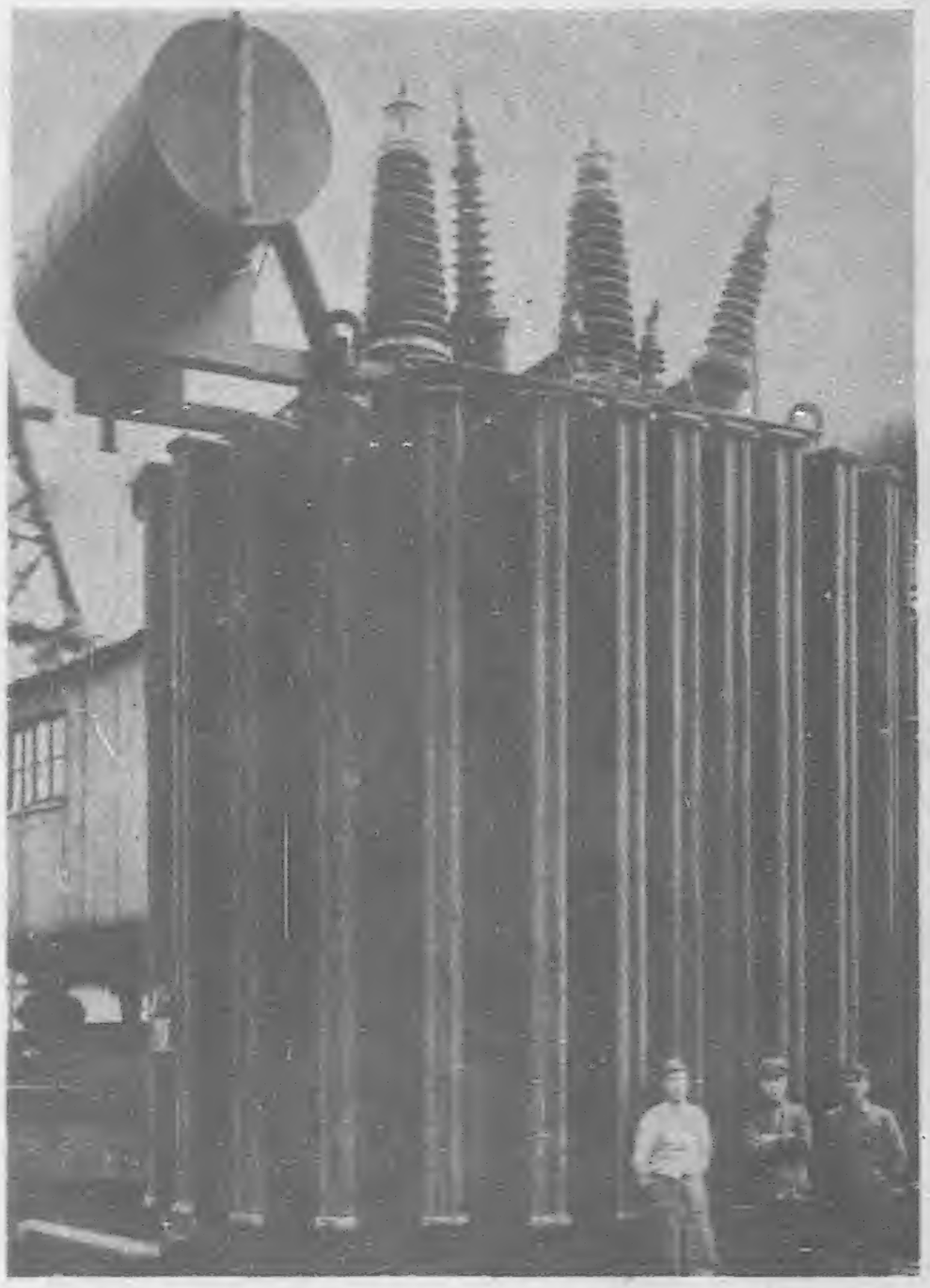
It is the ultimate intention to operate the passenger locomotives on the very heavy gradient sections where the railway crosses the Ghats. On these gradients, which average as much as 1 in 40 for long distances, a passenger train will be assisted by a freight locomotive operating as a banking engine, the characteristics of the locomotives being such that they will operate together with a proper sharing of the load.

Large Capacity Electrical Apparatus in Japan

THE large-scale electrical undertakings in Japan—hydro-electric power plants, sub-stations and long-distance transmission lines, steam generating plants of large capacity, railroad electrification and the wide use of electricity in the industries—have made that country prominent among the electrified nations of the world.

Japan at an early date caught the vision of national benefits to be derived from electricity and did not hesitate to draw upon America and Europe for the necessary apparatus. Economic considerations are now leading her to produce within her own borders more and more of what in the past she has imported.

One of her leading makers of electrical apparatus is the Shibaura Engineering Works, a company that is associated with the General Electric Company (U.S.A.), and since the earthquake and conflagration of 1924, which wrought havoc with its factories, a new and modern manufacturing plant has been erected and equipped at Tsurumi near Tokyo, manned throughout by Japanese mechanics and laborers, under the guidance of Japanese engineers. This plant is turning out both light and heavy apparatus, some of which exceeds in size any corresponding apparatus ever before made in Japan or imported there from other countries.



22,000 KvA. Self-cooled Transformer Made by Shibaura Engineering Works

Electric locomotives of 106 tons are successfully designed and built at Tsurumi for the Japanese Government Railways. In the line of station apparatus certain large units have been produced by this company that are of particular interest.

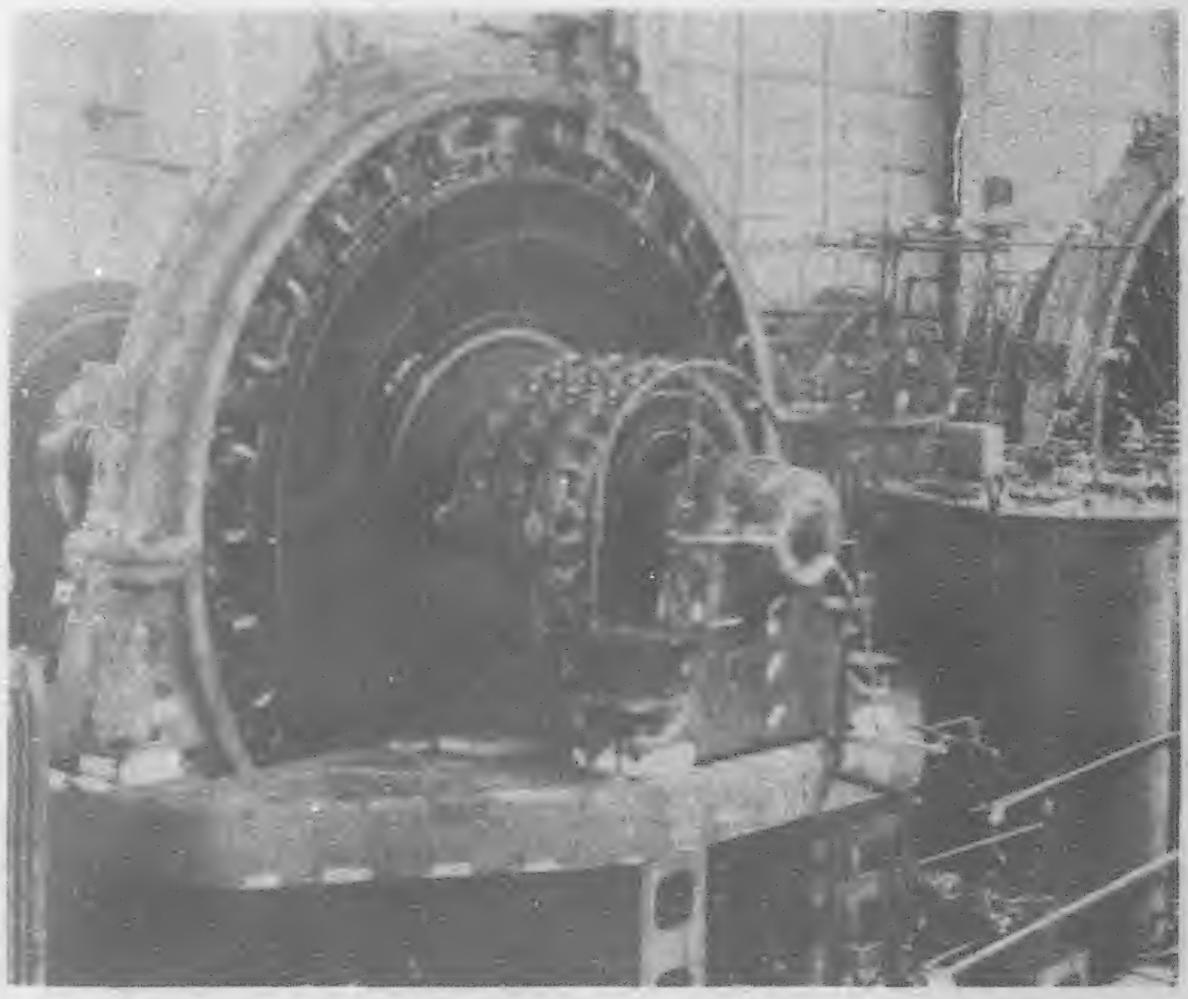
In Chosen (Korea) are important chemical works at Konan, producing ammonium sulphate for use as fertilizer. Some 60,000 kilowatts of direct current is required for the electrolysis of the water. Hydrogen, thus liberated, after mixture with air, compression, heating, and passing through a special process, is combined with nitrogen from the air to make ammonia, and this, in combination with sulphuric acid, produces the ammonium sulphate.

Direct current for the process of electroysis is obtained from thirteen 4,500 kw. rotary converters made by Shibaura. These are six-phase machines, 430/500 volts, 240 r.p.m. For starting there is provided for each a 450 h.p., 60-cyle, three-phase synchronous motor of 3,000 volts, 240 r.p.m. By use of this motor the rotary converter is automatically synchronized and goes on to the line without shock. It is a system that has been patented by the makers and has the merit of safety, ease and celerity in bringing the rotary up to synchronism.

The chemical company buys current from Chosen Suiden K.K., who purchased from the Shibaura Engineering Works three 36,000-kv.-a. and three 34,500 kv.-a. three-phase transformers, which raise the voltage at the generating station from 11,000 volts to 110,000 volts and reduce it to 11,000 volts at the end of the transmission. These are all of the water-cooled core type and have special oil adapted to a cold climate. They are wound for 63,500/-110,000 Y.11,000 volts with taps on the high tension winding for 60,600 and 57,700 volts delta.

For the Showa Electric Power Company some large transformers have been made by Shibaura that establish a record in size for the self-cooled type so far as Japan is concerned, either as regards local manufacture or importation. They have a capacity of 22,000 kv.-a., 60 cycles, and are of the single-phase, self-cooled, core type with a tertiary winding. The voltage rating is 80,800/140,000 Y.46,600/80,700, with secondary taps for 44,400-42,200/-77,000-73,000 and a tertiary winding for 11,500/11,000/10,500 volts. The tertiary capacity is 11,000 kv.-a. These nine transformers are designed to work in parallel with water-cooled, shell-type transformers.

A waterwheel-driven alternating generator having the largest capacity ever produced in Japan is one of 15,000 kv.-a. of the vertical type, three-phase, 50-60 cycles, 6,600 volts, 250/300 r.p.m. To this is directly connected a 100 kw. exciter. This machine was built for the Minakata generating station of the Tenryugawa Electric Power Company, to be used in parallel with a foreign-made generator, and the two together will serve to charge a 154,000-volt transmission line of 161 miles.



Synchronous Rotary Converter of 4,500 Kw. under Construction by Shibaura Engineering Works at Tsurumi

The rotor spider is built up of ½-in. rolled steel plates, to which the pole pieces are dovetailed. It is constructed in six segments to permit disassembly for shipment from the factory, as the completed rotor, measuring 12-ft. in diameter, is too large for transportation railroads. Reassembly was made at the power station.

Two other generators of 15,000 kv.-a. and two of 8,000 kv.-a. have also been built by the Shibaura Engineering Works for large generating stations of Japan.

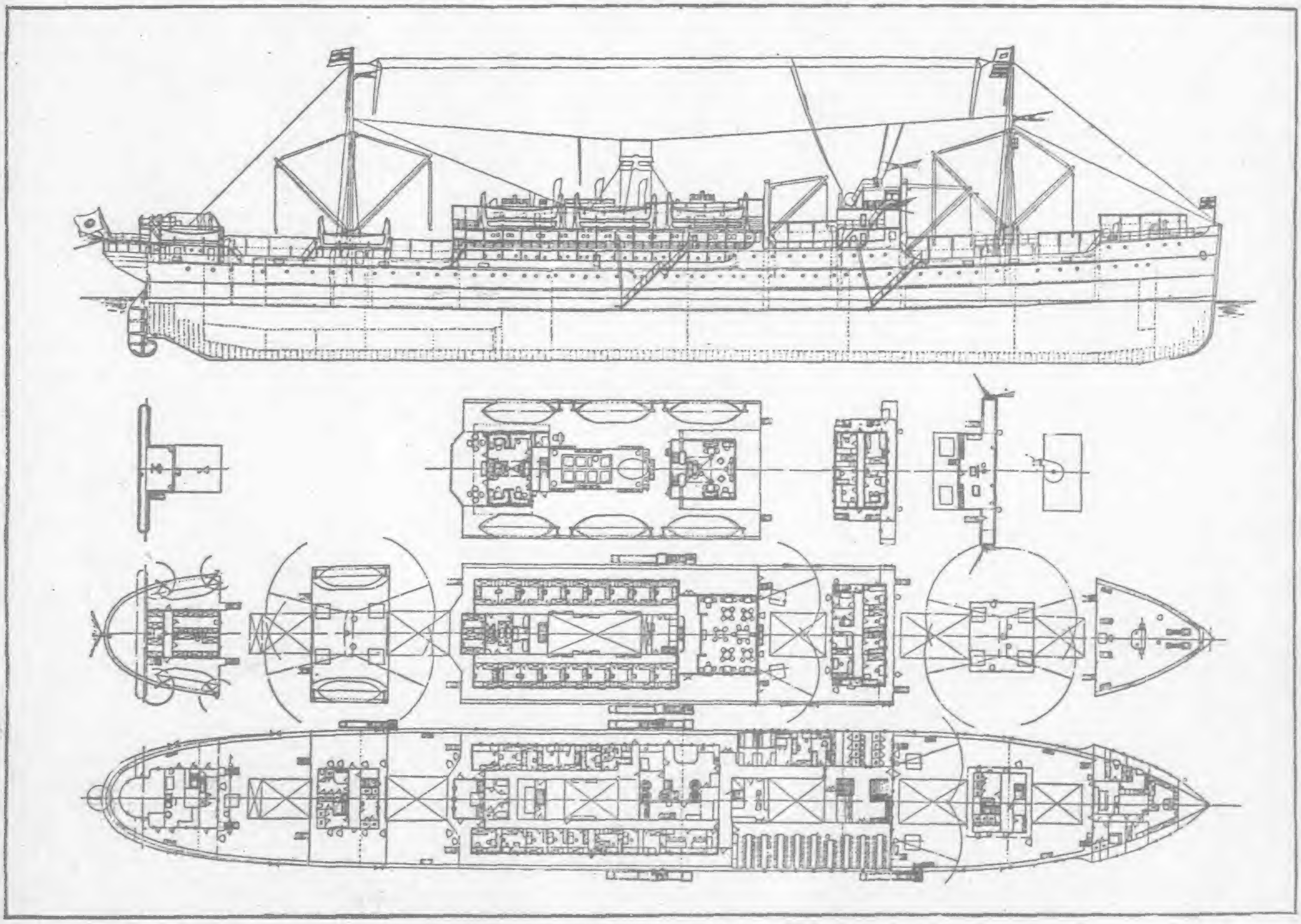
A Japanese South American Passenger Ship

The "Montevideo Maru," with Accommodation for 150 First and Second-class Passengers

THE s.s. *Montevideo Maru* is one of three similar vessels completed for the Osaka Shosen Kaisha for their regular passenger and cargo service to South America and round the world. The plans of the ship here published are of some interest in view of the services for which it was constructed.

The particular ship indicated is the *Montevideo Maru*, the other vessels being the *Santos Maru* and *La Plata Maru*. She is 430-ft. long, with a beam of 56-ft. and a moulded depth of 36-ft., having been constructed at the Mitsubishi Zosen Kaisha's yard. The deadweight capacity is 7,300 tons, and in addition to accommodation for 40 passengers in the first-class and 110 in the second-class, 681 steerage passengers can be carried. The capacity of the fuel oil tanks is 430 tons, and 1,790 tons of ballast can be accommodated. The cubic capacity of cargo is 388,400 cubic ft. and the gross tonnage of the ship is 7,260.

In the engine-room amidships are installed two Mitsubishi-Sulzer engines, each of 2,300 b.h.p., having six cylinders 600 mm. bore with a piston stroke of 1,060 mm. The speed is 110 r.p.m. Scavenging air is supplied by a turbo blower, and there are three 250 b.h.p. Sulzer airless-injection engines driving 150 k.w. dynamos, as well as a 37.5 k.w. stand-by generating set. An oil-fired Cochran donkey boiler is installed for supplying steam to the galley and for heating purposes.



Plans of the Cargo and Passenger Ship "Montevideo Maru"

New Mitsui Bank Building in Tokyo

(Continued from page 408).

and plumbing is taken from a well which has been dug down to 320 feet inside the building. The city and well water is pumped to the roof for storage. Iced drinking water is piped to all floors in brass pipes. Drainage of rain and waste water is provided directly to the city sewerage system above the first floor, but is pumped out from the basement from a sump.

The fire-fighting and prevention equipment includes automatic and hand-operated fire shutters over all openings and a complete water and alarm system, together with two electric and one gasoline emergency pumps in the basement.

The ten elevators for passengers have a capacity of 2,500 pounds and a maximum speed of 500 feet a minute.

The pneumatic tube system serving the two first floors is of brass tubing 1 foot by 5 inches by 2.5 inches.

Two main electric lines enter the building from two independent sub-stations, while emergency equipment includes a storage battery with a gasoline-electric generator. Other electric apparatus includes nine switchboards, 700 inter-office telephones and 180 electric clocks controlled by two master clocks.

The Modern Plant of the Nippon Electric Company, Limited, at Tokyo

By A. G. JILLARD, Far Eastern Director of Manufacture

A DESCRIPTION of the plant and work of the Nippon Electric Company, Limited, would not be complete without reference to the situation at the time of the Great Earthquake of September 1, 1923, and the very radical changes it brought about. At that time the plan for the ultimate development of the plant included the construction of buildings up to the property lines, and the five buildings which had been built in accordance with that plan were of reinforced concrete. Four of these buildings were three stories high, and one was partly two stories and partly three stories high. (Figure 1.) The total gross floor area in these reinforced concrete buildings was 185,750 sq. ft., and the total gross floor area of all buildings then on the compound was 293,753 sq. ft. The earthquake completely ruined the reinforced concrete buildings down to the level of the second floors, though it has been practicable to use the ground floors of these buildings, after proper repairs, until new buildings could be built. As all of the other buildings on the compound were small, and old structures marked for demolition, the earthquake resulted in a situation calling for the reconstruction of the entire plant.

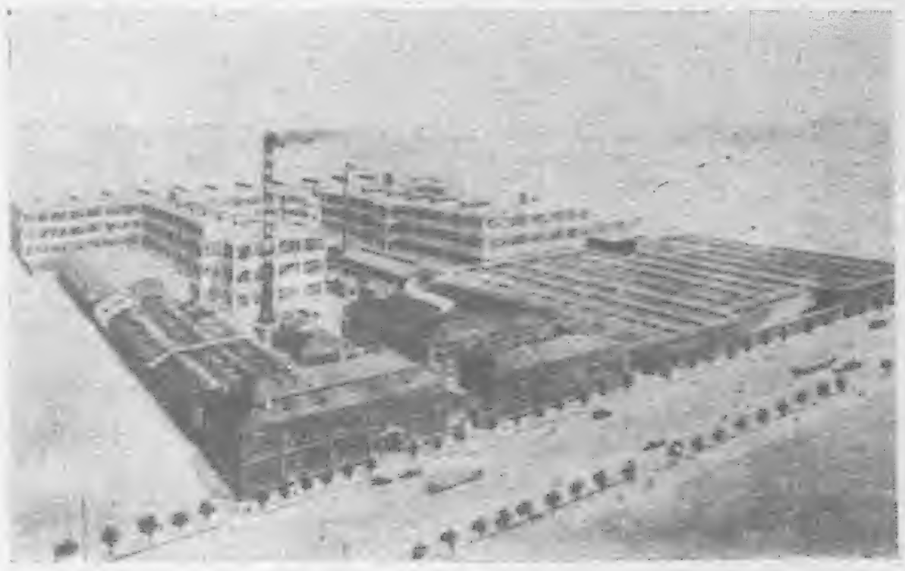


Fig. 1.—The Nippon Electric Company Plant at the Time of the Great Earthquake of September 1, 1923

Prior to the Great Earthquake, manual telephone equipment only had been used by the Department of Communications; but since fourteen of the nineteen exchanges in Tokyo and both exchanges in Yokohama were destroyed by the earthquake and fire, the Department of Communications very wisely concluded that it was a most propitious time for the adoption of an automatic system.

The Company therefore faced a situation calling not only for disposal of wreckage and the repairing of buildings, equipment and apparatus, but also for immediate preparation for the manufacture of a complete line of automatic central office and subscribers' equipment and the rebuilding of the entire plant with a minimum of interference with production.

While this was a gigantic task fraught with difficulties and commenced under most depressing conditions, it has been handled in a manner which has brought forth much favourable comment, and the company is justified in feeling proud of what has been accomplished.

Demolition of the wrecked portions of the buildings and the salvaging of materials, parts, apparatus, and equipment were started simultaneously on the seventh day after the quake, and twenty-seven days later the Manufacturing Branch began delivering fully repaired apparatus. Remains of buildings were made usable, and regular production was resumed with remarkable speed, while at the same time plans were being made for new buildings and preparation was commenced for the manufacture of automatic apparatus.

Including a two-storey steel-frame warehouse in a detached compound, the Company now has more floor area than at the time of the quake, and eighty per cent. of it is in newly-constructed buildings. Fifty per cent. of the ultimate building plan has now been realized. (Figures 2 and 3.)

The New Plant

After very careful study of all types of buildings throughout the earthquake zone, the Company decided against the construction of reinforced concrete buildings and adopted steel-frame construction with reinforced concrete walls, floors and roof slabs. At the same time there was developed an entirely new ultimate plan (Fig. 4) in which the buildings are set back from the property lines on the sides and back of the compound, thus greatly reducing the fire hazard and permitting all building entrances, except the main entrance, to open within the Company's property instead of to the public streets. The structures are built to the property line on the front street, which is sufficiently wide to permit of this without undue hazard. (Figure 5.)

The three connecting buildings at the front of the compound are 60-ft. wide and four stories high. Buildings in the parallel wings which join the front buildings are partly four and partly three stories high, being 80-ft. wide on the first floors and 60-ft. wide on the floors above, thus providing light courts for the illumination of the second, third, and fourth floors. Skylights in the roofs over the first floors at the bottom of the light courts provide additional illumination for the first floors. This plan gives a large proportion of first floor area, which is of great importance in a country regularly visited by earthquakes, because it permits keeping all heavy loads on the ground floor.

As the building and floor areas are limited by Municipal Ordinance, one of the paramount aims of the designers was to utilize the entire floor area allowed, while producing a group of buildings pleasing in appearance, capable of withstanding severe earthquake shock and fire exposure, and so laid out as to efficiently meet the requirements of a modern manufacturing plant.

The total gross floor area in the main buildings in the ultimate plan is 441,940 sq. ft., while that in detached buildings to be used for the storage of highly inflammable materials, automobile garage, etc., is 5,876 sq. ft.

Fig. 2.—Some of the New Buildings, Showing the Main Entrance and the Completed Frontage on the Main Street

Fig. 3.—Warehouse in the Detached Compound

The buildings were designed through co-operation of the architects of the Nippon Electric Company and Japanese and American consulting engineers, all of whom had made studies of the effect of the earthquake and fire on all standard types of building construction, and were therefore especially qualified for the task set before them.

Borings to a depth of 100-ft. were made at various parts of the compound to determine the nature of the underlying strata; various test piles were driven and bearing tests were conducted, with the result that reinforced concrete piles of the pedestal type were adopted. The foundations consist of individual footings under interior columns and continuous footings under outside and special columns. All foundations are of reinforced concrete and are connected by structural steel tie-beams encased in concrete.

Fig. 4.—Architect's Drawing of the Ultimate Development of the Main Compound

In designing the buildings, the assumed seismic coefficient was .15, although municipal regulations require but .10, and the assumed stiffness ratio between exterior and interior bents was three to one.

The structural frame of the buildings consists of steel of rolled and built-up sections, riveted completely. All members are encased in reinforced concrete. A safety factor of four was used in designing the steel frame, and all stresses in the frame, both from vertical load and earthquake shock, are resisted by the structural steel. Specially designed connections of extra strength are used between columns and beams, and knee-braces are used between columns and beams in exterior bents.

In the concrete design a safety factor of four was used, and all concrete was prepared in accordance with Professor Abram's method. Periodic tests on 6-in. cube samples, seven days old, showed a consistent compressive strength of over 2,000 lbs. per square inch. Concrete, except in reinforced slabs and footings, is considered only as fire-proofing for the steel; but the concrete design covered special features, including extra heavy walls on both sides of exterior columns, diagonal reinforcing at the four corners of all wall openings and diagonal reinforcing in all floor slabs around columns. In addition, the roof slabs of the light courts are sufficiently heavy to transmit stresses between adjacent wings.

Steel window sash glazed with ¼-in. wire glass is used throughout the plant, while doors are of steel and are fitted with closing devices which operate automatically in case of fire.

Modern hydrant and automatic sprinkler systems were adopted for installation throughout the plant. As severe earthquakes sometimes break the city water mains, and as suppliers of electric power open their switches when there is a quake of unusual severity, outside sources cannot be depended upon for water and electric power at times of greatest need. Provision for enabling the company to operate its fire protection system efficiently without aid from outside sources was therefore important, and to this end the system includes an artesian well and extra large storage reservoir, together with an auxiliary oil engine for operating the pumps when the power supply is cut off.

Manufactures and Equipment

Manufactures of the Nippon Electric Company comprise central office and subscribers' equipment for both manual and step-by-step automatic telephone systems, and include telephone repeaters, loading coils, special communications appliances, electric meters and switches.

Manufacturing equipment is modern and includes screw machines and lathes, milling machines, power presses, wood-working machinery, composition molding equipment, miniature lamp equipment, machinery for the manufacture of bare and insulated wire, switchboard cable, black enamelled wire, telephone cords, etc.

The Tool Making Department is manned by expert toolmakers and is equipped with modern precision machines, including a jig

(Continued on page 423).

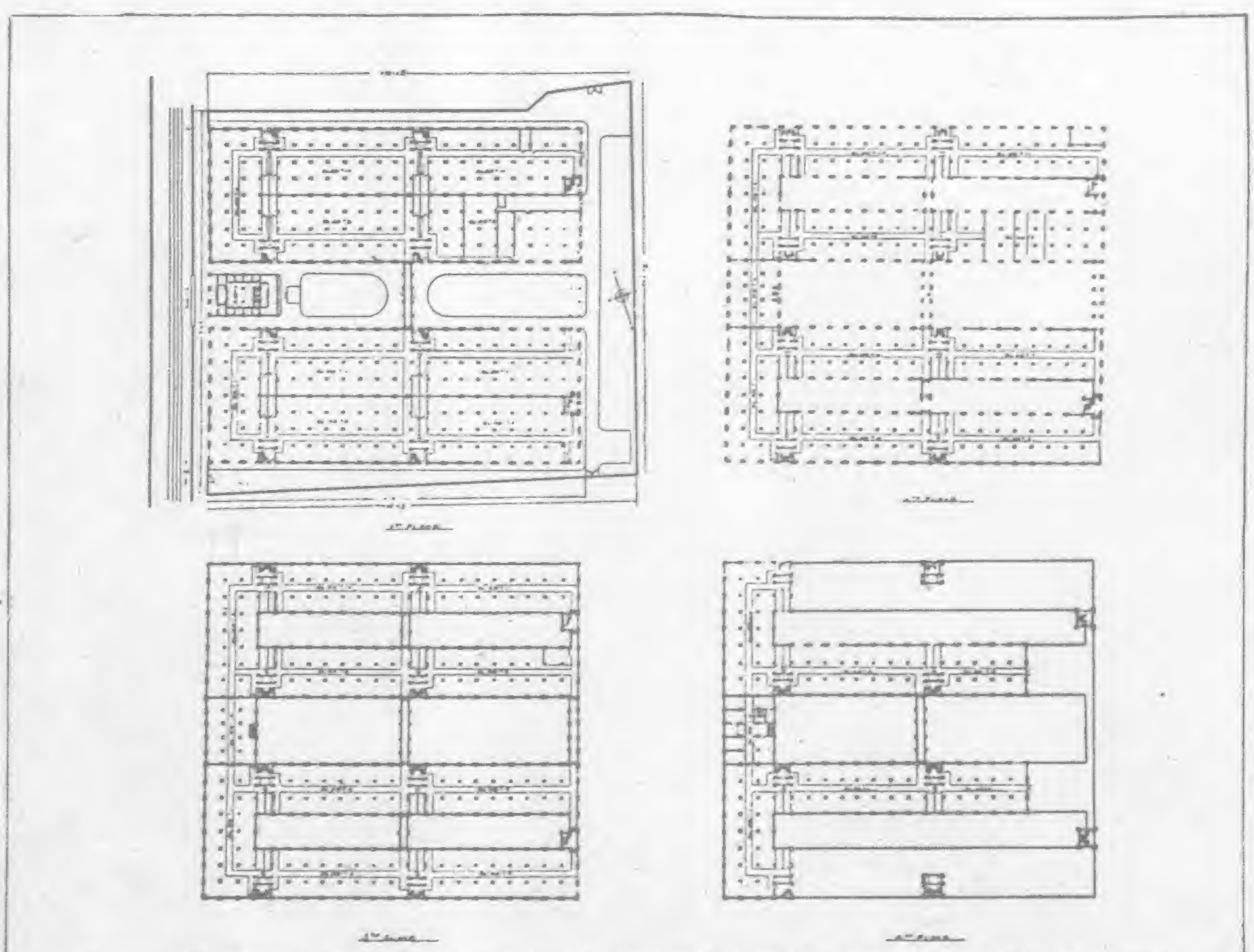


Fig. 5.—Floor Plans of the Buildings in the Ultimate Development of the Main Compound

Osaka Builds More Movable Weirs

Plan to Facilitate Drainage of Minor Branch Rivers Running Through City Making Good Headway

By EISABURO KUSANO

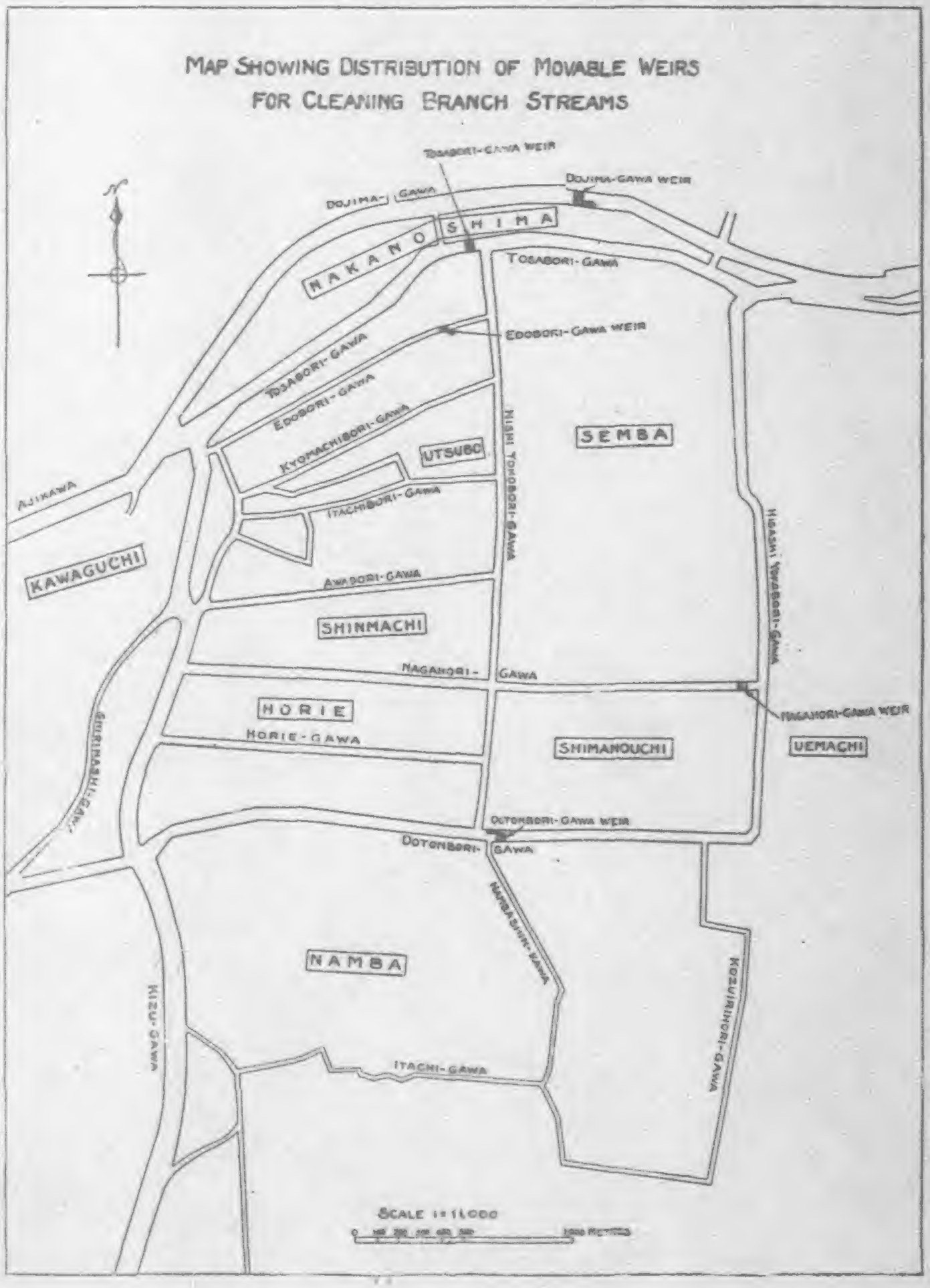
THE Osaka Municipality, which has just completed the construction of the movable weir on the Dojima-gawa, is now erecting two more of them on the Tosabori-gawa and the Dotombori-gawa with the object of increasing the water of the minor branch rivers running in all parts of the city so that the drainge be improved and simultaneously canalization be facilitated.

The city of Osaka, which is often referred to as the Chicago or the Manchester of Japan, is one of the most thriving industrial centers of the Empire, and as a matter of course, there are many factors which have worked together to account for the present day prosperity. But, there is no denying that much of its progress was due to canal facilities of the Yodo-gawa and its innumerable branch streams flowing in all directions throughout the city.

It is many years ago that an altogether new main water way of the Yodo-gawa was opened in the north-western outskirts of the city, and it has relieved permanently of the danger of the "Industrial Water Metropolis" being flooded. The completion in later years of other improvements near the river mouths of major streams has greatly promoted the canal facilities, thus further contributing to the progress of the city. Unfortunately, however, the quantity of water running at minor branch streams considerably decreased as the result of the foregoing improvements on the major rivers.

The drainage of minor streams was found in such an undesirable condition that it gave rise to a serious social problem known as the low water issue. The city authorities, therefore, effected an extensive betterment of minor branch rivers beginning in 1916; they rebuilt the embankment, and dredged the river-beds. The work, however, failed to bring forth the desired effect, so far as the cleaning of water of minor streams was concerned.

With this in view, an investigation committee was organized in 1923 under the joint auspices of the Department of Home Affairs, the Osaka Prefectural Government, and the Osaka Municipality, in accordance with the suggestion adopted by the Osaka Municipal Assembly in 1922. The committee drew up a draft plan of leading more water from major streams of Yodo-gawa to minor rivers in the city, and it was approved by the Municipal Assembly at its session of December, 1924.



Outline of Plan

To begin with, the quantity of running water at minor branches declined because of the fact that the water level of the main streams, namely, the Dojima-gawa and the Tosabori-gawa, had become lower. With this fact in view, it was decided that current of these main streams be restricted by means of building movable weirs at the upper stream of the Oe-bashi (bridge) on the Dojima-gawa and also at the upper stream of the Higo-bashi on the Tosabori-gawa so that a portion of the running water be directed into Higashi Yokobori-gawa and Nishi Yokobori-gawa thence to minor streams.

Furthermore, the plan provides to build three more movable weirs on the Nagahori-gawa, Dotombori-gawa, and Edobori-gawa so that the water which is directed into Higashi and Nishi Yokobori rivers from the Dojima-gawa and Tosabori-gawa be more effectively distributed among other minor branch streams.

Dr. Saburo Okabe, engineer of the Department of Home Affairs, was entrusted with the work of designing these movable weirs, and he decided on the taintor-gate system in consideration of the following facts:

1. The general appearance of the movable weir has to be pleasant, the operation must be easy, and the time required in the opening and closing must be brief, in view of the fact that the Osaka city's movable weirs are situated in the center of the city and also as they are opened and closed very frequently.

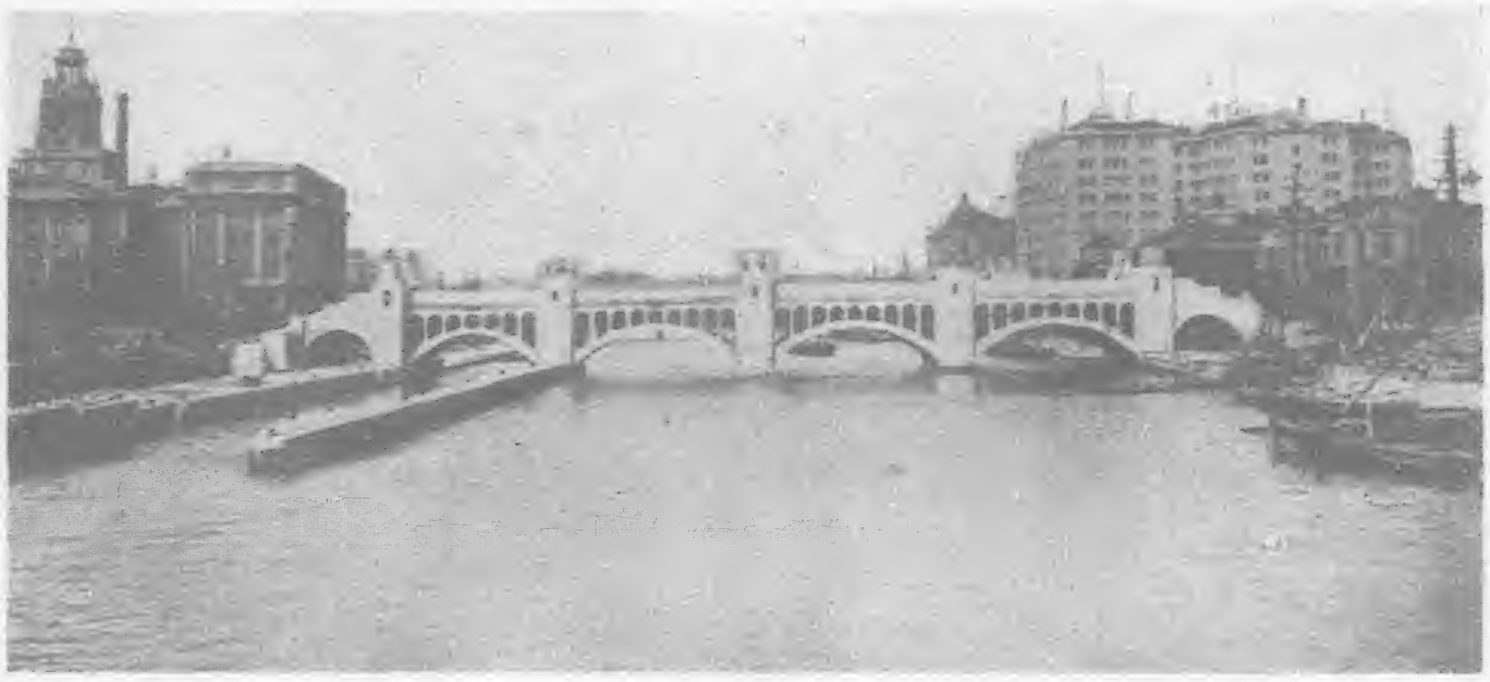
2. The movable part of the weir must be selected out three types, namely, rolling dam, stoney-gate, and taintor-gate, because of the fact that the difference of the water-level of the upper and lower streams on the Dojima-gawa and other rivers in Osaka is small. The rolling dam is found unsuitable as it spoils the scenic beauty, while the stoney-gate costs an enormous amount of money in order to hide the movable part of the weir under the bridge-bed as the bridge must have a considerable height. On the other hand, the construction of the

A Side View

taintor-gate requires a relatively small amount of money, and it serves well the purpose of draining minor streams, hence the adoption of this system.

Dojima-gawa Weir

The construction of the movable weir on the Dojima-gawa, which was the first one to be built in Osaka, was commenced in June, 1926, and was completed towards the end of March, 1929, after two years and nine months' work. It is 298 feet long, and has four spans; three of these spans are 50 feet wide and the remaining one is 40 feet in width. And, it has four taintor-gates, all of which are 50 feet by 14 feet, except one which is 40 feet by 14 feet; the last mentioned is for the adjoining lock. The gate bed is O.P. minus 6.00, that is, 6 feet below low water; the gate-sill is 5.5 feet below low water, and the top of the movable part of the gate is 8.5 feet above high water. The width of the bridge between rails is 31 feet. The self-weight of the gate is about 20 tons; it is fixed with the same axle with the counter weight so that the operation of the gate may be eased. Both the pier-bed and the weir-bed stand on piles.



A General View

The Osaka Municipality has just completed the movable weir on the Dojima-gawa as shown in this picture with the object of increasing the water of minor branch rivers running in all directions in the city so that the drainage be improved and incidentally the canalization be facilitated. The city is building two more of them of similar type on the Tosabori-gawa and the Dotombori-gawa. It is expected that the city will build still two more of them on the Nagahori-gawa and the Edobori-gawa in the course of the coming few years.

In the aggregate total, the cost of construction of the Dojima-gawa movable weir amounted to Y.843,840, but it includes the price paid for materials which may also be used in building other movable weirs.

The taintor-gates of this weir, as well as those of other weirs, are opened or closed by induction motors, but they can be operated by hand as well, when the electric current was temporarily suspended or when the motors are out of order. The shafting, which is put into operation by alternative current motors, revolves the rack fixed outside of the counter weight, thus opening or closing the gates. It takes two minutes when electrically operated.

There is a transformer room in the light-post box on the southern end of the bridge, and power is supplied by high pressure transmission lines from the Horikawa and Kitahama transformer stations and also from the Nakanoshima transformer station by low pressure transmission line; the last mentioned is for lighting lights above the bridge, but in the event of the power supply from the two other stations by high pressure line be cut off by accident, this line is switched on other lines to light signals and lights under bridge-bed on behalf of ships passing below the weirs. In the switchboard room below the bridge-bed at the southern end, there is main switch by operation of which the power required for operating gates and putting on lights is transmitted to the operation rooms.

The Dojima-gawa weir has three 15 k.w. transformers for power supply, one 10 k.w. transformer for signals and other lighting, and one 5 k.w. transformer for lighting lights above the bridge. And, it has six three-phase alternative current 200 volt induction motors; of these, four of them are of 10 h.p., used in operating taintor-gates, and one is 7.5 h.p., used for operating a 21 ton arch type gate of the upper stream of the adjoining lock, and the remaining one is 3 h.p., used in operating sluice valve.

Lock of Dojima-gawa Weir

Along the southern embankment of the Dojima-gawa, there runs a reinforced-concrete lock. The lock chamber is 40 feet wide by 200 feet long; the depth of the invert centre is 8 feet below low water and that at both sides is 6 feet below low water. The upper gate is of arch type, having a width of $32\frac{3}{4}$ feet with a height of 17.8 feet; the thickness at the centre is 2.6 feet and it weighs 21 tons. It is fixed to the left-hand side wall, and is opened or closed by turning the gate 90 degrees. There is a sluice conduit, which is 5 feet high and 6 feet wide; a small taintor gate is used for the sluice valve.

The lower gate is a taintor-gate, 40 feet by 14 feet, and the bed-sill is 6 feet below low water. It has no sluice conduit; instead, the time-relay system is adopted; when opening this taintor-gate, the electric current is cut off automatically for one, two, or three minutes as it may be previously fixed when the bottom of the gate reached the point of one foot above the gate-sill so that the difference of the water level inside and out of the gate may be diminished in the meantime; this device is to prevent ships in the lock from receiving sudden shock by quick speed of the current.

In operating the lock, including the urgent case of disposing the flood discharge, the lower gate (taintor-gate) is closed, and then, the sluice valve is opened in order to make the water level even with the upper stream so that the upper gate of the lock may be opened. The upper gate then is fixed, and the lower gate is opened, and thus the upper and lower gates are left open to let the water flow undisturbed.

A Front View

Northern Side Under Construction

Under Construction (Southern Embankment of the River)

The outstanding feature of this lock is that the taintor-gate is adopted for the lower gate, so that this may be opened or closed regardless of the difference of the water level or speed of the current.

It might be added here that blue lamps will be lighted at nights when the gates are all left open, and when they are closed, two red lamps will be lighted, above each gate on the bridge, in order to give warning to the ships. Just before the gates are put into motion, an electric siren will be blown for one minute, and at the same time, two red lamps will be turned on and off alternatively.

Tosabori-gawa Weir

The construction of the movable weir on the Tosabori-gawa was started in March, this year. It is expected to be completed some time during the next fiscal year. It will have two taintor-gates of 50 feet by 14 feet, and two sluice gates of 21 feet by 14 feet. The gate bed of these four gates is 6 feet below low water. The general appearance of this movable weir is much the same as that of the Dojima-gawa weir. In building this movable weir, the well-sinking system is adopted because of the fact that the nature of the river-bed necessitates it. The estimated cost of construction of this weir is Y.500,000.

A Light Post

Dotombori-gawa Weir

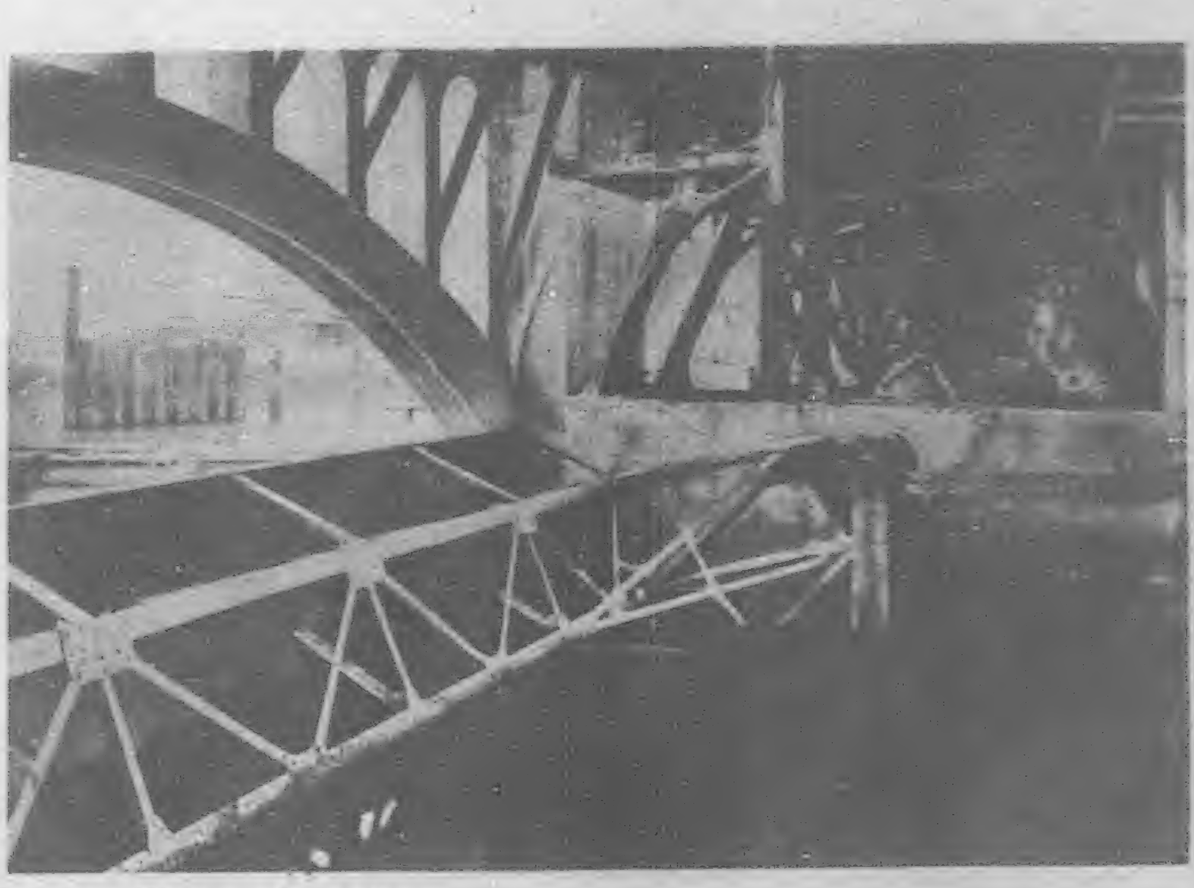
The construction of this movable weir has just been started to be finished also during the next fiscal year. It will have three taintor-gates ; one is 50 feet wide by 13 feet long, and its gate bed is going to be 4 feet below low water ; the remaining two of them are 24 feet by 13 feet, and one of these is for the adjoining lock. The gate-bed of these two is going to be 5 feet below low water. The estimated cost of construction is Y.280,000.

Other Weirs

Two more movable weirs are to be built on the Nagahori-gawa and the Edobori-gawa ; the construction of these weirs will be started some time in 1913 to be completed during the following year. They will have only one taintor-gate each of somewhat smaller size.

It is worthy of special mentioning that the span of these weirs, already built or being built, is designed to be as large as possible in order that the width of the river may not be narrowed down so that the flood discharge may be disposed of easily and also the navigation may not be inconvenienced. The

(Continued on page 424)



The Taintor Gate and its Counter Weight in Action

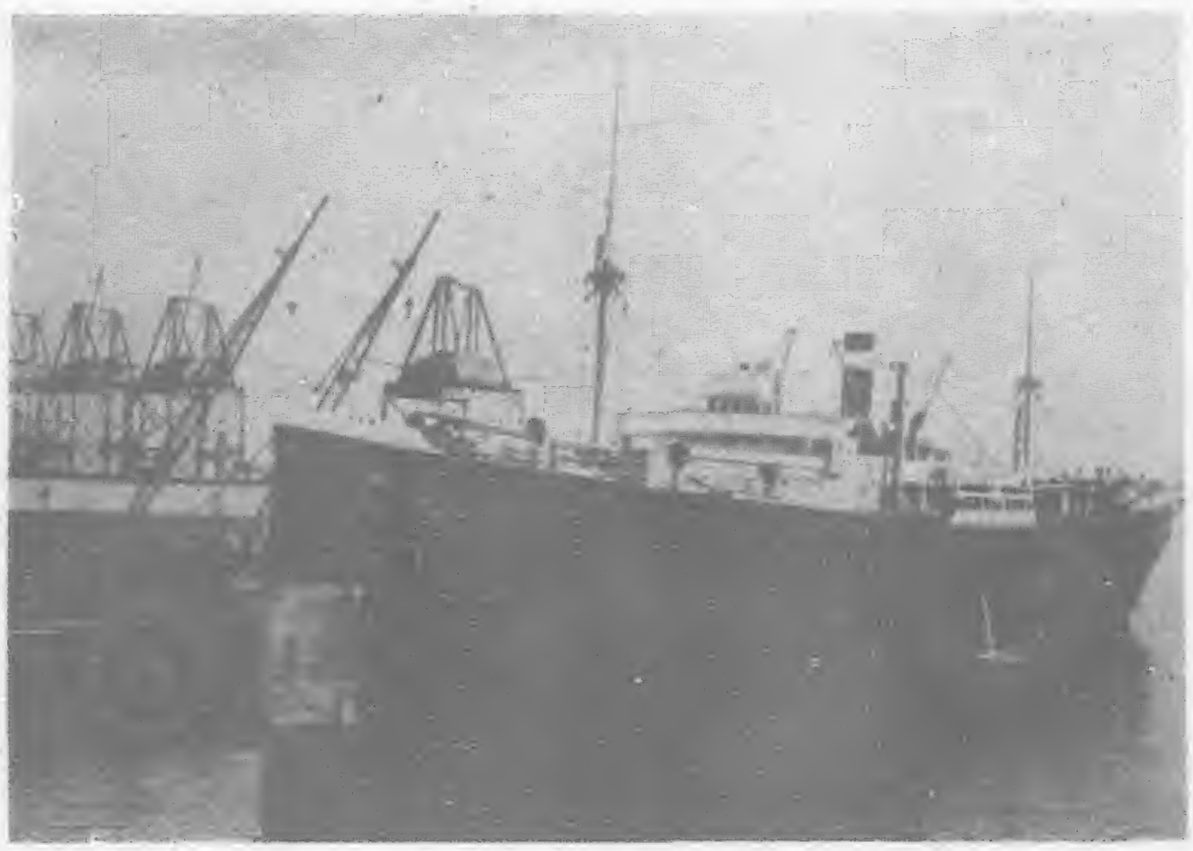
The M.S. "Courageous"

New Diesel Engine-Propelled Ship for the Far East Service

THE *Courageous* has been converted from a steamer to Diesel electric drive for the United States Shipping Board. On trials she attained a speed of 15.3 knots. Four 1,280 b.h.p. McIntosh & Seymour engines are installed, each being coupled to two G.E.C. dynamos with a total output of 800 kw. The propulsion motor is a double unit type, consisting of two motors of the same class, each rated at 2,000 b.h.p. The control is on the variable voltage system, with operating stations in the engine-room and pilot-house. All deck and engine-room auxiliaries have been converted to electric drive, utilizing motors aggregating 700 h.p.

The engines are of interest in view of the attention now being devoted to the possiblities of trunk-piston machinery in high powers on motor ships, both with direct drive and in conjunction with electric transmission. The eight-cylinder McIntosh & Seymour trunk-piston motors in the *Courageous* have a height to the top of the fuel valve of only 11-ft. 7-in., and the weight is stated to be 144-lb. per h.p. They run at 250 r.p.m. The overall length is 31-ft. 8-in.

A notable difference exists in the design of these engines compared with trunk-piston machinery built in Europe—for instance, the B. and W. type. The McIntosh & Seymour engine has the frames and base each cast in one piece and of semi-steel reinforced with ribs. This means that the whole of the water jackets forms one casting, the cylinder liners being separate and let into the casting from the top. Spur and wheel gearing is retained for driving the camshaft through a vertical shaft, the chain drive, much used in Europe, not being employed. The pistons are oil-cooled and the engine is of the air-injection type, the three-stage air compressor mounted at the forward end being driven from a crank on an extension of the crankshaft. A feature of the whole installation, and undoubtedly one of the virtues of the Diesel electric drive, is that the electric motor runs at the low speed of 60 r.p.m.



The Diesel-electric Ship "Courageous"

The *Courageous* and her two sister ships, the *Defiance* and *Triumph*, are to trade to the Far East in competition with the Silver Line and Prince Line motor-ships, all of which maintain speeds of between 13 and 14 knots. This is no doubt the reason of the desire of the United States Shipping Board to increase the speed of their vessels after conversion. Originally they averaged only 9½ knots at sea.

General Data and Characteristics of Vessel

Length overall	468-ft. 6-in.
Length between perpendiculars (A.B.S.)	458-ft. 0½-in.
Beam moulded	56-ft. 0-in.
Depth moulded at side to Shelter Deck	38-ft. 0-in.
Displacement at normal mean loaded draft	15,360 tons
Gross tonnage	7,572
Net tonnage	4,826
Normal mean load draft	27-ft. 8½-in.
Deadweight capacity on said draft	10,680 tons
Bale capacity, including deep tank	562,370 cu. ft.
Capacity of deep tank—salt water	807 tons
Capacity of I.B. fuel oil tanks and settling tanks	1,269 tons

MAIN ENGINES.

Make	Four McIntosh & Seymour Corpn.
Type	Single acting, 4-cycle, air injection
Dia. of working cylinders	20.00 inches
Stroke	24.00 inches
Number of cylinders	8 each
B.H.P.	1,200 each
R.P.M.	250
Piston speed	1,000-ft. per minute
Fuel nozzles	1 top
4 air starting flasks	capacity 16 cu. ft. each. Working pressure 1,000 per sq. in. (maximum)
4 injection air flasks	capacity 2¼ cu. ft. each; 1,000 pressure per sq. in. (maximum)
Cooling	Jackets, salt water, and pistons, oil
Maxim silencers	

PROPULSION MOTOR.

Make	General Electric
B.H.P.	4,000
R.P.M.	60
Volts	750
Type	Double armature, direct current pilot house control

MAIN GENERATORS.

Make	General Electric
K.W.	800
Volts	375
R.P.M.	250

EXCITER GENERATORS.

Make	General Electric
Kw.	100
Volts	240
R.P.M.	250

EMERGENCY LIGHTING SET.

Make	Fairbanks-Morse Company
Type	Single acting, two-cycle, solid injection
Dia. of working cylinders	5¾-in.
Stroke	6½-in.
Number of cylinders	4
Kw.	36
R.P.M.	800
Piston speed	875-ft. per minute
Cooling	Salt water
Generator	36 K.W. Fairbanks-Morse
Maxim silencers	

PUMPS.

Fire and Sanitary—2 Worthington centrifugal, 200 g.p.m., 1,310-1,750 r.p.m. motor; General Electric 15-25 h.p.

Bilge and Ballast—1 Worthington rotary, 300 g.p.m. motor—General Electric 15 h.p., 850 r.p.m.

1 Worthington 8-in. by 8-in. geared triplex reciprocating 300 g.p.m. motor—General Electric, 15 h.p., 850 r.p.m.

Drinking Water—1 Worthington centrifugal, 25 g.p.m., motor 1½ h.p., General Electric, 1,750 r.p.m.

Fuel Oil Transfer—1 Worthington rotary 150 g.p.m., motor General Electric, 7½ h.p., 850 r.p.m.

Washing Water—1 Worthington rotary 25 g.p.m., motor General Electric, 2 h.p., 1,150 r.p.m.

Lubricating Oil—4 Worthington rotary 366 g.p.m., 583 r.p.m., driven through reduction gear from circulating pump motor.

Cooling Water—4 Worthington centrifugal 400 g.p.m., motor 50 h.p., 1,750 r.p.m., on common base and driven by same motor as lubricating oil pump.

Evaporator Feed—Dean Bros. horizontal duplex, 4-in. by 3¾-in. by 5-in.

Boiler Feed—Worthington horizontal simplex, 3½-in. by 2¼-in. by 4-in.

BOILER.

Vertical type, working pressure 110-lb. gauge.
400 sq. ft. heating surface.
Oil burner—Ray No. 4.

ICE MACHINE.

Brunswick-Kroeschell 3-ton ammonia direct expansion type, direct driven, motor 5 h.p. Diesel 170-215 r.p.m.

PROPELLER.

Four-blade built-up type.
Diameter 21-ft. 6-in., pitch 22-ft. 9-in.

STEERING CONTROL.

Sperry telemotor—Ward-Leonard control, with automatic follow-up. Hand, non-follow-up. 45 h.p. motor, General Electric, 550 r.p.m.

WINCHES.

Twelve cargo, Hyde Windlass Company, self-oiling, special design, electric driven, General Electric 25 h.p. motor and control quick make and break type controller. Winches fitted with General Electric shoe brakes. Warping winch rebuilt for motor drive. Motor, General Electric 25 h.p., 575 r.p.m.

WINDLASS.

Rebuilt for motor drive. General Electric 70 h.p. motor, 500 r.p.m., and control panel. General Electric shoe brake.

FIRE EXTINGUISHING SYSTEM.

Phomene system. One Phomene accumulator, capacity 2,400 gallons of foam per charge with water accumulator. 600-gal. capacity 100-lb. pressure. Four 2½-gal. hand extinguishers.

RAIDO.

1 kw. spark and 2 kw. arc.

WHISTLE.

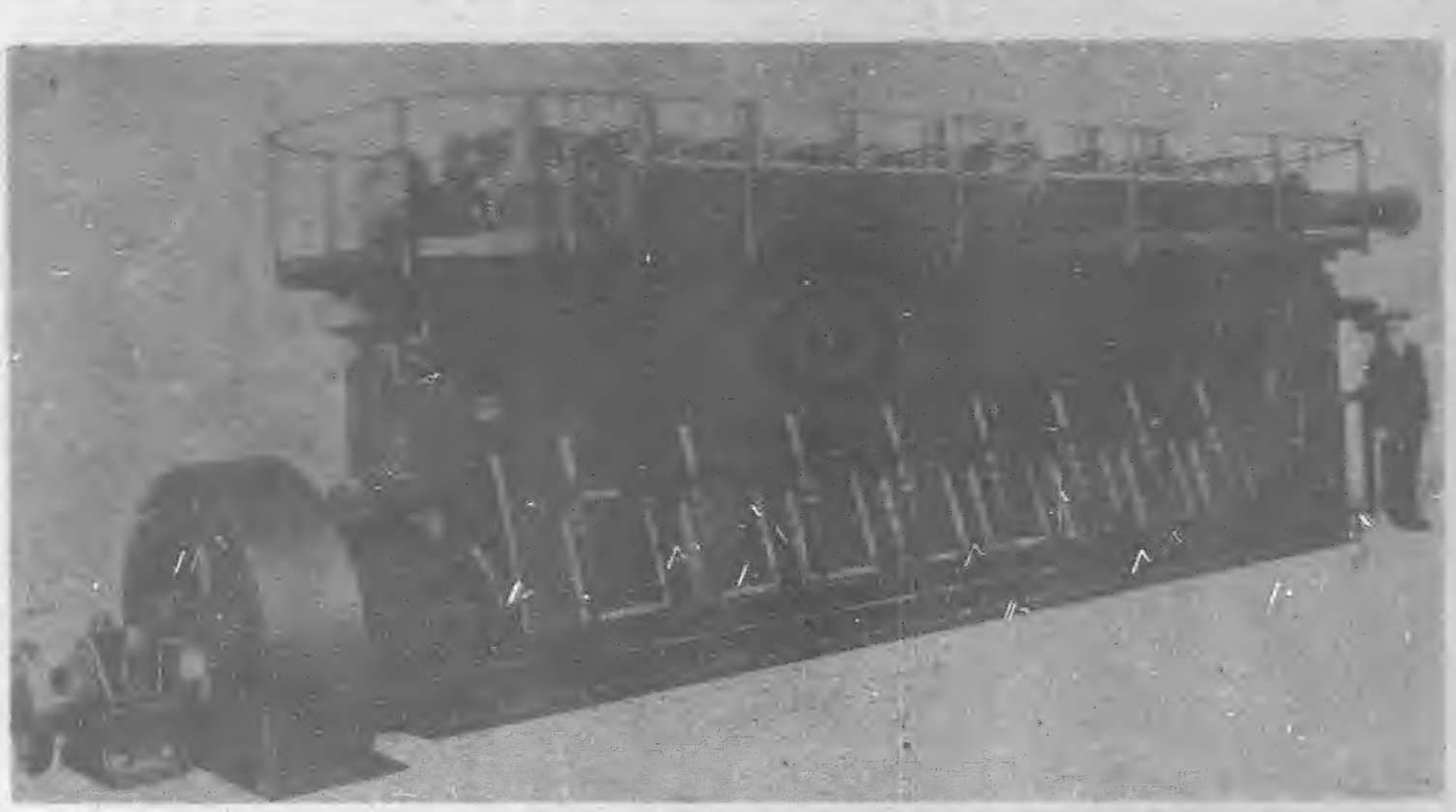
Typhon—air tank 15 cu. ft. cap. 150 pressure per sq. in.

SEARCHLIGHT.

General Electric incandescent 1,000 watts.

GALLEY.

Range—New York French Range Company, oil-fired, fitted with Ray burner. Size 0.



One of Four 1,280 B.H.P. Diesel Engines Installed in the "Courageous"

Coffee Urn and Water Boiler—Automatic Electric Heater Company. Raidant type, specially designed, 4.5 kw. Capacities: coffee 5 gallons, water 10 gallons.

Hot Water Heaters—Main, Automatic Electric Heater Co., 4.5 k.w.—100 gallons; Crew, Automatic Electric Heater Co., 1.5 k.w.—15 gallons.

OIL SEPARATORS.

Manufactured by De Laval Mfg. Company.
2 fuel oil 500 g.p.h. at 80° pressure type 600.
2 lub. oil 240 g.p.h. at 120° open type 600.

MAIN PROPULSION EQUIPMENT—VENTILATING BLOWERS.

2 blowers, Sturtevant, multivane 7 design 3, D.W. and D.I.; capacity 35,000 c.f.m. each—5-in. static pressure.
Motors, General Electric, 60 h.p. each, 845 r.p.m.

AUXILIARY AIR COMPRESSOR.

Worthington 8 cu. ft. per min. 1000 per sq. in. pressure; Air cylinder, 4½ by 4½. Steam cylinder, 4 by 3½ r.p.m. 450.

LUBRICATING OIL COOLERS.

3 Andale Engineering Co., 850 sq. ft. of cooling surface each.

THRUST BEARING.

Kingsbury Machine Works. Collar 41½-in. dia., 7-in. face.

LUBRICATING OIL HEATER.

Andale Engineering Co., 300 g.p.h. 60° to 120°

The M.S. *Courageous*, which is operated by the Roosevelt Steamship Company of New York, for whom L. Everett, Inc. are agents in the Far East, recently arrived in Shanghai after having made a record run from New York to Manila, via San Pedro and Honolulu, in 37 days, operating at the fast speed of 16 knots per hour.

The Modern Plant of the Nippon Electric Company, Limited, at Tokyo

(Continued from page 418).

horing machine of extreme accuracy and a measuring microscope of most recent design. Modern tool-making and heat treating practices are employed.

Inspection Methods and Engineering

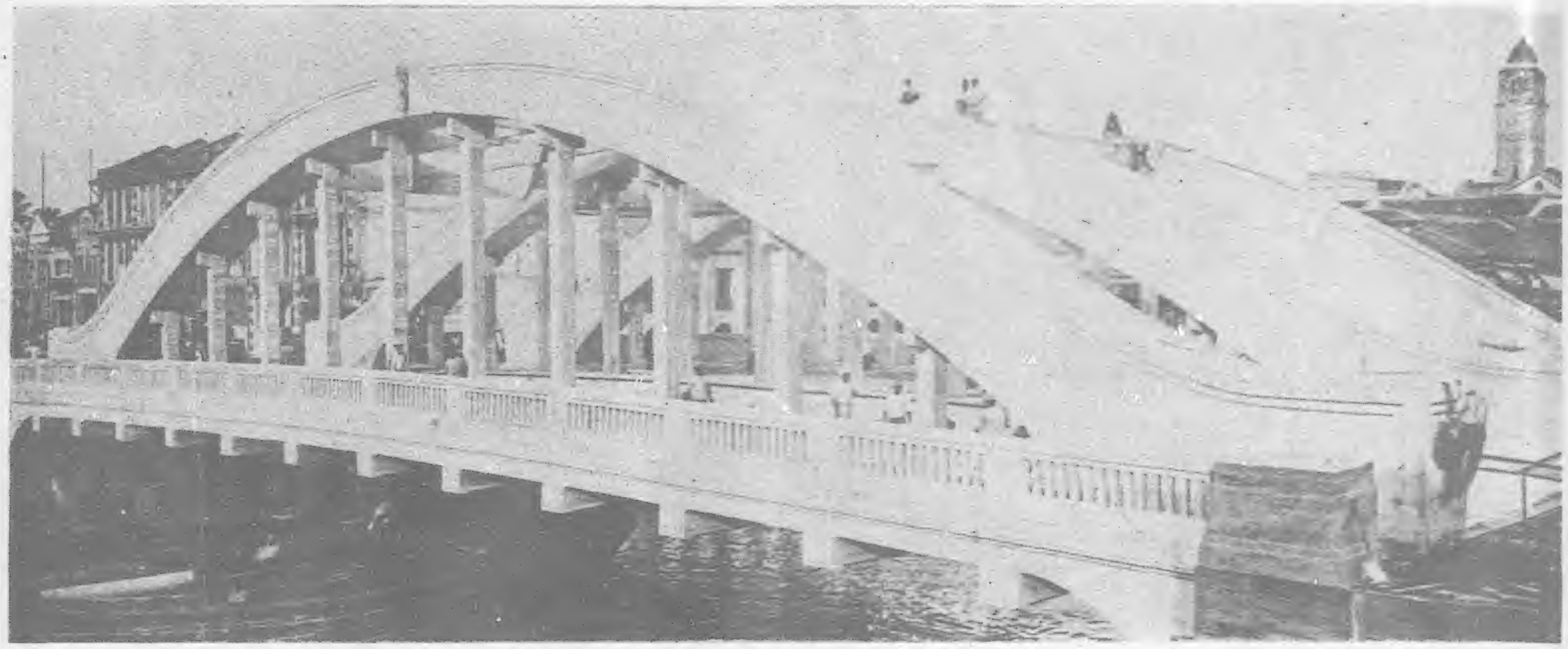
A completely organized inspection department maintains a rigid inspection of raw materials, parts and completed apparatus, and is amply provided with precision testing and measuring equipment. The Company's product is carefully and minutely inspected in order to maintain the highest commercially practicable standard of quality.

A well-equipped chemical laboratory is provided for analytical work and the control and supervision of chemical processes.

Studies covering the improvement of existing manufacturing methods and equipment, the development of new processes, methods, equipment, etc., and the preparation of manufacturing and material specifications are also carried on by manufacturing development engineers.

The Engineering Department includes a staff of trained engineering specialists with expert knowledge of modern communications systems and equipment. In addition, information is regularly received on improvements in manufacturing and inspection developments from the Western Electric Company, Inc., and from the central organization of the Nippon Electric Company's associated companies.

A check inspection of completed apparatus is carried on by the Engineering Department and is accomplished by selecting at random a percentage of the regular shop output and subjecting it to a rigid engineering inspection. This inspection is independent of the regular manufacturing inspection, and is in the nature of an additional precautionary measure to ensure the maintenance of the high standard of excellence of which the Company is justly proud.



New Elgin Bridge, Singapore

The New Elgin Bridge, Singapore

IN the designing of bridges over the Singapore river the governing facts are the clearance necessary above high-water mark and the low level of the approach roads in relation to the river. These facts limit the choice of design for reinforced concrete bridges to the possible variations in one type, that in which the deck is slung below the arches. Since wide roads are necessary as well as a thin deck there must generally be more than two arch ribs. The difficulty and expense of making satisfactory arch abutments in the very unsatisfactory ground on the banks of the river practically eliminates the true arch and compels the use of a tie-bar, " bow-string" as it is frequently called, which, buried in the concrete of the deck, resists the horizontal thrust of the arch springings by tying them together across the river so that no thrust is taken by the supporting masonry.

Elgin Bridge is therefore a bow-string arch structure, supported on plain concrete abutment walls 20 feet high, founded on oval reinforced concrete caissons sunk to depths of from 60 to 80 feet below the road. The reinforcement of the arch ribs is in the form of rivetted structural steel, so that it might support itself and the shuttering and wet concrete, without the necessity of erecting false work from the river bed. The span of the arch is 146-ft. 3-in.

In order to avoid the severe bending stresses which occur at the crown of a bow-string arch owing to the stretching of the tie-bar, a hinge was set in the crown in the form of a pair of steel knuckle castings. In order to allow the tie-bar to stretch freely as the concrete in arches and deck was poured, roller bearings were set under the northern ends of the three ribs. Since deflection changed progressively as the concrete was built into the structure it was necessary to set each end of each rib upon pairs of steel knuckle castings, in order that the loads applied to the abutment walls might remain constant in point of application and truly vertical. The result is a three-hinged arch.

The actual movement of the roller bearings during construction was three-quarters of an inch. Further movement under live load will be microscopic in comparison, and movement under temperature variation is practically negligible in Singapore owing to the very small annual range of temperature. Indeed, once the structure is complete roller bearings and hinges are less necessary than during construction.

The form of the arch curve is parabolic. The ribs being three-hinged are naturally thickest at the quarter points and thinnest at springing and crown. Since they are long struts, without the more usual side support afforded by a superimposed deck, it was necessary to put in a certain amount of overhead bracing.

Osaka Builds More Movable Weirs

(Continued from page 421)

bridge of these weirs is higher than the street level, but it is and will be adjoined with the street with steps so that the weir may also serve as ordinary bridges.

Operation of Weirs

It is understood that these movable weirs be closed at night when the canal traffic is less frequent, and that they be left open during the day and also whenever the water rises. Nevertheless, they may be partially closed even during the day so long as it does not bring about much inconvenience to canal facilities. In addition, the movable weirs of the Dojima-gawa and the one now being built on the Dotombori-gawa are provided with a lock and by operating these locks in similar manner as is done at the Panama Canal, ships may pass the weirs even when all the taintor-gates are closed. Thanks to this device, the navigation on the main streams as well as other branches will not be disturbed even when all of these weirs are closed.

When all the gates of the Dojima-gawa and the Tosabori-gawa movable weirs are closed at times of high tide or when the quantity of flowing water is temporarily high, the water level of the upper stream exceeds 7.5 feet above low water which is the maximum height provided in the regulations in accordance with which the enbankment improvement of the branch streams in Osaka city was carried out some years ago ; and then, there is possibility of giving adverse effects in the upper stream. Consequently, the Dojima-gawa and the Tosabori-gawa weirs are equipped with a special device by means of which one of the taintor-gates opens automatically when the water leval reaches 7.5 feet above low water, and then close again when the level is lowered below 7 feet above low water. Furthermore, when the opening of one each of the taintor-gate of the Dojima-gawa and the Tosabori-gawa is found insufficient to regulate the flowing quantity of these main streams, the watchman's attention will be drawn to this fact as a bell in his room will ring automatically by means of a special device.

The Airless-injection Double-acting-engined M.S. "Kulmerland"

FOR some years past the Hamburg-Amerika Line have, in part, operated their Far Eastern service with motor ships. The first vessel, the *Havelland*, was constructed in 1921. This was followed by the *Ermland* and *Rheinland* (lost in 1926), the *Munsterland* (1922), *Vogtland* (1924) and *Friesland* (1925), also a second *Rheinland* (1927). They are all ships of between 9,600 and 10,400 tons deadweight, and except for the *Friesland* which has a service speed of 12½ knots, and the last *Rheinland* (of 13½ knots), all are 12-knot ships.

Under the owners' new building program, which was decided about a couple of years ago, five new motor ships were ordered for the Far Eastern trade, namely, the *Leverkusen*, *Duisburg* and *Kulmerland*, to be equipped with A.E.G.-Hesselman airless-injection double-acting engines, the *Burgenland* with an M.A.N. double-acting two stroke motor, and the *Sauerland* Sulzer machinery. A further order was afterwards placed for a similar vessel, to have an A.E.G.-Hesselman motor.

The ships are approximately similar, apart from the machinery, and the last of the first batch of orders, the *Kulmerland*, was completed in March. A feature of particular interest in these vessels, which are mainly cargo-carrying craft, is that there is comfortable passenger accommodation for 24 passengers, in ten two-berth and four single-berth compartments. This is something of a novelty for ships engaged in the Far Eastern trade and has involved the provision of a dining room, a smoking room and a ladies' room, whilst the cabins themselves are exceptionally commodious and provide a really comfortable means of travelling to the Far East for those who are not hurried in their journey.

The "Kulmerland"

The following are the main particulars of these ships :—

Length overall	147.3 meters (481 ft.)
Length b.p.	140.72 meters (460 ft.)
Moulded beam	18.29 meters (60 ft.)
Depth to main deck	9.25 meters (30.4 ft.)
Draught on Summer freeboard	7.88 meters (25.8 ft.)
Deadweight capacity on maximum draught	10,600 tons (or 1,000 kg.)
Service speed, laden	13 knots
Speed with maximum power	13.5 knots
Normal machinery power	4,500 b.h.p.
Maximum machinery power	5,100 b.h.p.
Guaranteed oil consumption at maximum power	22 tons per day
Gross tonnage	7,385.88 register
Net tonnage	4,363.85 register

The *Kulmerland*, also the *Leverkusen* and *Duisburg*, were built at the Deutsche Werft, the *Burgenland* being constructed at the Flensburg yard, and the *Sauerland* by F. Schichau.

The hull is divided into a fore peak and three cargo holds forward of the engine-room, in addition to three aft, cargo oil tanks being provided in hold No. 5, so arranged that they can be utilized for other cargoes. These tanks have a capacity of about 14,500 cubic ft., and the total cargo hold capacity is 15,781 cubic meters or 557,331 cubic ft. bales, corresponding to 615,562 cubic ft. grain.

The Simplex Balanced Rudder

The fuel oil is carried in double-bottom tanks 2, 3, 4 and 5, also in a deep tank and tunnel tank, as under :—

Tank 2	262 tons
Tank 3	299 ,,
Tank 4	179 ,,
Tank 5	132 ,,
Deep tank, port, frames 74 to 86	141 ,,
Deep tank, starboard, frames 73 to 86	141 ,,
Deep tank, port, frames 59 to 73	130 ,,
Deep tank, starboard, frames 59 to 73	142 ,,
Tunnel tank, port	68 ,,
Tunnel tank, starboard	99 ,,
Total	1,593 tons

This is for oil reckoned at a specific gravity of 0.88 and tons of 1,000 kg.

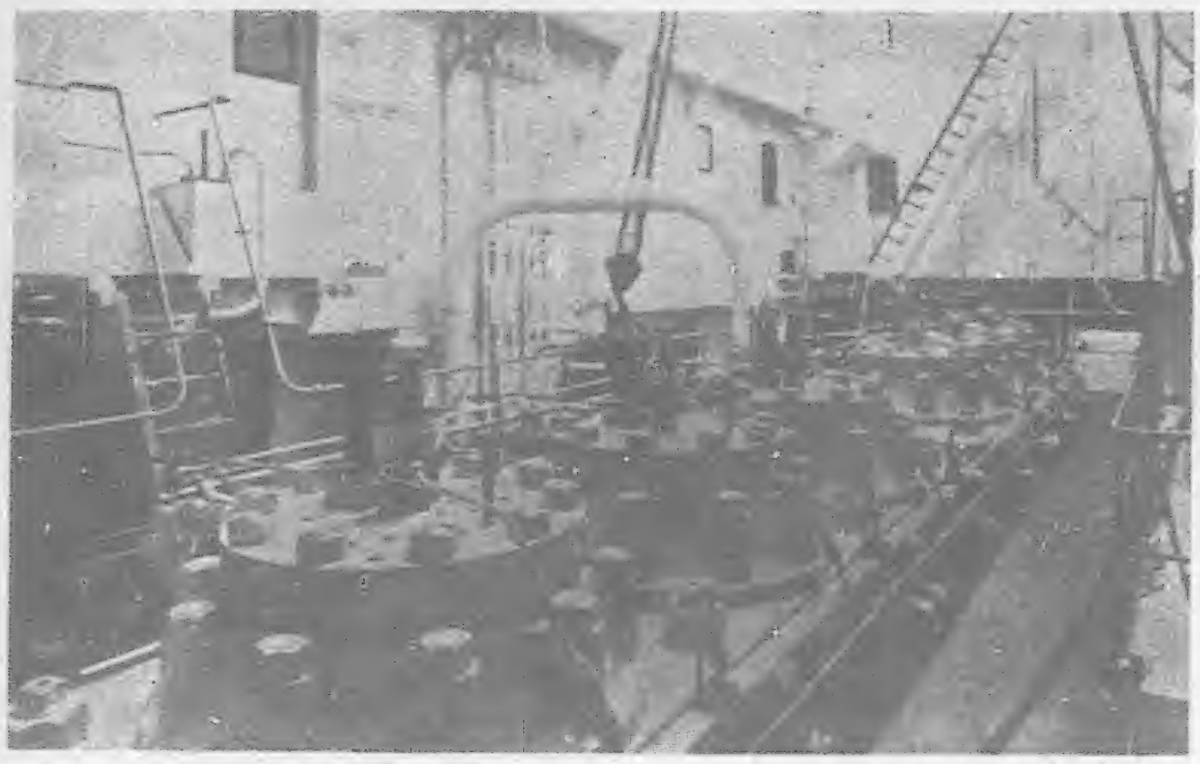
Eighty-two tons of cooling water (fresh water) are carried in tank No. 4 in the double bottom at the center, whilst in the after peak 93 tons of fresh water are accommodated. Two 30-ton tanks for drinking water are arranged on No. 2 deck port and starboard, making a total of 60 tons. One hundred and forty-five tons of ballast water are carried in tank No. 1, whilst there are 70 tons in tank No. 6, 195 tons in the fore peak, 44 tons in the after peak, making a total of 454 tons.

The exact details of the loading of the cargo holds are given in the table below :—

Hold No.	Location	Frame No.	Cub. Meters	Cub. Ft.	Total Cub. meters	Total Cub. ft.
I	In Hold	131–156	937	33,092		
II	,, ,,	108–131	2,260	79,815		
III	,, ,,	86–108	2,000	70,633		
IV	,, ,,	42–59	1,267	44,746		
V	,, ,, Port	27–42	482	17,023		
V	,, ,, Starboard	27–42	473	16,705		
VI	,, ,,	10–27	930	32,844	8,349	294,858

Hold No.	Location		Frame No.	Cub. Meters	Cub. Ft.		
I	IV–III	Deck	131–156	521	18,400	521	18,400
I	III–II	,,	131–156	720	25,428		
II	III–II	,,	108–131	1,119	39,519		
III	III–II	,,	83–108	1,263	44,605		
IV	III–II	,,	42–59	853	30,125		
V	III–II	,,	27–42	651	22,991	4,606	162,668
I	III–I	,,	135–156	507	17,906		
	II–I	,,	126–135	280	9,889		
II-III	II–I	,,	93–126	1,366	48,243		
IV	II–I	,,	45–59	551	19,459		
	II–I	,,	38–45	273	9,641		
V-VI	II–I	,,	15–38	892	31,502	3,869	136,639
			Total, for grain			17,345	612,565

The oil bunker capacity of 1,593 tons renders it possible to make a round trip from Miri to Borneo *via* Colombo, Port Said and Hamburg and back or approximately 20,000 sea miles, without rebunkering. Actually, on the complete round trip from Hamburg to the Far East and back the ship covers 25,000 to 31,000 sea miles and calls at least at 25 ports.



The Cylinder Heads of the Engine in the "Kulmerland," Showing the New Form of M.A.N. Construction

Accommodation for Passengers, Officers and Crew

In the poop on the main deck are three cabins for 15 sailors and one boy, as well as three further cabins for six greasers and three boys. Around the engine-room casing on the upper deck are the cabins for the second, two thirds and a fourth engineer, the electrician and two assistants besides the cook, stewards, stewardess, boatswain and a carpenter.

On the promenade deck are the dining saloon, ladies' room and smoke room forward, together with the cabins for the 24 passengers. The first, second, third and fourth officers, as well as the wireless operator, are berthed forward on the boat deck, the chief engineer having his cabin aft, whilst the captain's quarters are on the boat deck. In all, the crew totals 68 men.

An Exhaust-heated Boiler

Accommodation throughout is heated by the low-pressure system supplied from an exhaust-heated boiler with a heating surface of 35 square meters and a working pressure of about 10 lb. per sq. in. It supplies hot water for heating the accommodation as well as the daily supply tanks and lubricating oil tank. For heating the accommodation in port there is a low pressure water-heating system of the back-pressure type, with a surface of 4.5 square meters, heated from steam from the auxiliary boiler. The heating apparatus is so dimensioned that with an outside temperature,—5 deg. C., the temperature in the cabins can be raised to 20 deg. C., and in the engine-room to 5 deg. C.

In each passenger cabin of the two-berth type are cot beds, two wardrobes, open wash basins and cupboards.

On deck are 14 electric winches, capable of lifting three tons at a speed of five meter per second, and four winches for lifting seven tons at two meter per second. The 3-ton winches are driven by compound motors of 25 b.h.p., and of 37 b.h.p. for the 7-ton winches. The anchor windlass is driven by a 65 h.p. motor. The rudder is of the Simplex balanced type, electrically operated.

It is unnecessary to describe in detail the engine installed in the *Kulmerland*, for this was fully dealt with in "The Motor Ship" previously. It is of the A.E.G.-Hesselman airless-injection design, and its installation in these four vessels of the Hamburg-Amerika Line represents its first application to marine work. As already recorded, it is designed for an output of 4,500 b.h.p. normally at sea, at 90 r.p.m., or a maximum of 4,100 s.h.p., having six cylinders 700 mm. bore, with a piston stroke of 1,200 mm. At the normal speed of 90 r.p.m. the piston speed is 3.6 meters per second, and at 120 r.p.m., when 6,000 s.h.p. is developed, the piston speed is 4.8 meters per second.

Performance

Some results of the performance of the *Leverkusen*, the first of the sister ships, are available. A trial was made in the Mediterranean at a speed of 14.47 knots, with the vessel fully laden and the engine developing 4,270 i.h.p. at 82.3 r.p.m. The fuel consumption was 0.3 lb. per i.h.p.-hour, which, allowing for a mechanical efficiency of 90 per cent, and adding the fuel required in view of the demand of the turbo blower, gives a consumption of 0.36 lb. per b.h.p.-hour. A speed of 14.46 knots was maintained for nine hours with the vessel fully laden, the engine output being 5,474 i.h.p. or 4,900 b.h.p. at 89.5 r.p.m. The fuel consumption was 0.375 lb. per b.h.p.-hour on the same basis. At 10 knots the daily fuel consumption was 9.2 tons for all purposes.

Some results of the tests of the engines carried out in the shops may also be given.

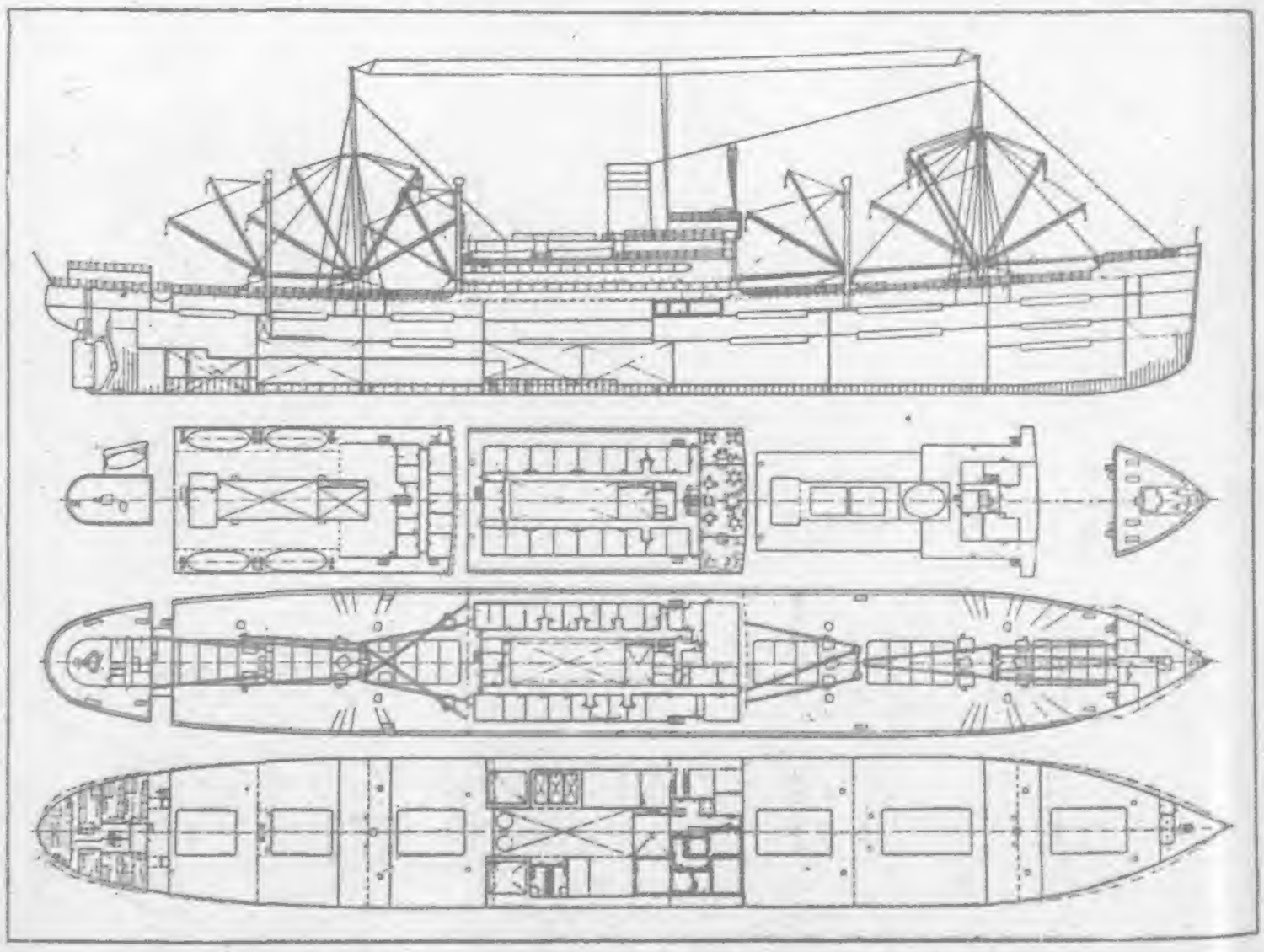
Shop Tests of 4,500-5,600 b.h.p. A.E.G. Hesselman Engine

Load	Full	Three-Quarters
R.p.m.	90	80
B.h.p.	4,500	3,160
I.h.p.	4,970	3,551
Mechanical efficiency	90.6	89
M.i.p. (upper) (kg. per sq. centimeter)	4.72	3.52
M.i.p. (lower) (kg. per sq. centimeter)	4.79	4.16
Fuel per b.h.p.-hour (grammes)	170.5	169
Fuel per b.h.p.-hour (lb).	0.376	0.373
Scavenge pump power absorbed (kw.)	180.5	166
Exhaust gas temperature (deg. C.)	180.5	169

The oil used was such as is bunkered in a ship at Miri, namely, Borneo oil with a calorific value of 9,650 calories per kg. At full load, adding the power required for the blower, the total consumption per b.h.p.-hour worked out at 181 grammes, or 174.6 grammes per b.h.p.-hour reckoned on fuel at 10,000 calories per kg. This is equivalent to 0.385 lb. per s.h.p.-hour. It will be noted that the scavenging blower absorbs a power equivalent to 5.3 per cent. of the output of the engine at full load.

These tests were carried out with considerable care and much detail, and the following figures relative to them are of interest since they are not usually given :—

Quantity of cooling water per hour for all cylinders, including covers	53.8 cubic meters per hour
Cooling water inlet temperature	19 degrees C.
Cooling water outlet temperature	47.8 degrees C.
Quantity of cooling water for pistons	26.2 cubic meters per hour
Piston cooling water inlet water	19 degrees C.
Piston cooling water outlet temperature	43.6 degrees C.
Exhaust gas quantity	68,200 kg. per hour
Exhaust gas temperature	185
Scavenging air temperature	31 degrees C.
Rise of temperature	154 degrees C.
Specific heat	0.238 k. cal. per kg.
Heat discharge per kg.	36.7 kg. calories
Percentage	33.8



General Arrangement Plans of the "Kulmerland"

Philippine Alcohol Production Rapidly Growing

By HIRAM MERRIMAN

WITHIN the past six years there has been quietly developing in the Philippines an industry that to-day has reached an annual output valued at P10,000,000—realized from a sugar by-product that formerly went to waste. This is the manufacture of motor alcohol from cane molasses. Down in the sugar provinces of Oriental and Occidental Negros alcohol is used by all the sugar people—in their lamps, their tractors and farm engines, their trucks, everywhere except in passenger automobiles, where more scientific progress is necessary before the new fuel can conveniently take the place of gasoline. Alcohol sells for 35 centavos a gallon; gasoline for around 80 centavos—there's the reason. The efficiency is about 80 per cent. that of gasoline.

Nature will produce alcohol from corn stalks, potatoes, trees, and, particularly of importance in the Philippine Islands, from the nipa palm that grows so luxuriantly over tens of thousands of hectares in otherwise valueless swamps. In the Philippines are vast supplies of raw material, and in China and other thickly-populated countries of the Far East is the market.

In 1921 only 480,000 proof liters of denatured alcohol were produced, for all purposes. The Carlos Palanca company the next year began production of motor alcohol, and by 1923 the production had risen to 3,235,000 liters. Last year there was used in the Islands and exported a total of 13,500,000 liters, and 1929 will see a further big advance.

The J. P. Foster formula for motor alcohol, evolved by a Hawaiian chemist, calls for alcohol 75 per cent., ether 25 per cent. and aniline oil ½ per cent. The volatile ether makes the engine start with a rush and adds to the heat content of the liquid mixture. The aniline protects the engine from being pitted by acids which alcohol forms in combustion. The beautiful point about alcohol, so far as motor engines are concerned, is that it produces no carbon, hence lessening of spark troubles and absence of cylinder scoring. One of the Carlos Palanca Company's trucks has been using alcohol fuel for seven years. During all that time its cylinders have been absolutely carbon-free.

At present, as before stated, passenger automobilists are finding difficulty in using alcohol. Adjustments have to be more perfect than with gasoline, and after several months of use the aniline oil makes a sticky deposit in the feed pipes, which must be removed. In the United States, experiments made by the Buick people with alcohol and high-compression engines show that alcohol produces 50 per cent. more power. If these experiments result in commercial use, the Foster formula will doubtless be improved to obviate present technical difficulties.

Apart from operation of passenger automobiles, alcohol can now be used for all manner of lighting, heating and machinery-moving appliances. The Negros tractors are being run by alcohol, and so are the passenger and freight trucks that crowd its roads. The sugar centrals are scrapping their coal-and-wood burning cane locomotives, and installing alcohol burners, and it costs them nothing; because all they have to do is to supply the molasses which formerly went to waste and in return receive 25 per cent. of the alcohol produced from the molasses, the distiller retaining 75 per cent. If the centrals allow the distillery to use steam from their boilers, then the centrals receive 40 per cent. of the resultant alcohol. This is certainly "something for nothing."

The Palanca interests are the Islands' largest manufacturers of all kinds of alcohol. The central distillery is the La Tondena, in Manila, which has recently been rebuilt after a fire that destroyed the plant. The capacity is 200,000 gallons of rectified alcohol a month. The Philippine Motor Alcohol corporation and the Bais Distilleries, Inc., under Palanca ownership, operate in Occidental and Oriental Negros, where there are four plants. A smaller plant is in operation in Mindoro. The capacity of these provincial distilleries is 250,000 gallons a month. The Ayala distilleries in Manila are also controlled by Palanca.

The Palanca company is also increasing its production of denatured alcohol, as used in cooking stoves, in paints and in lighting, particularly municipal lighting plants. Several thousand stoves, built to sell at from three to eight pesos each, have been imported from Germany and are being distributed throughout the Islands. The Standard Grade of alcohol for stoves, 90 per cent. alcohol and 10 per cent. water, has been abandoned by the company, and the present mixture is 95 per cent. alcohol and 5 per cent. ether. This mixture brings water to a boil in 30 per cent. less time than when using the Standard grade.

Manila Plant of Carlos Palanca & Co.

The Philippine companies have their eyes on the export trade. During 1928 more than 5,000,000 liters were exported, almost all of it to China. Java has the bulk of the China trade at present, with Formosa and the Philippines following closely.

The Philippine alcohol production of sugar molasses is of course a by-product and is limited by the amount of sugar. At present about 50 per cent. of the available molasses is distilled into alcohol. The great future source of Philippine alcohol will be from the nipa swamps which cover hundreds of square miles on all the largest islands. P. J. Wester of the bureau of agriculture estimates that one such swamp, on the northern shore of Mindanao, contains enough raw material for the whole present production of alcohol in the Philippines.

Once let the Chinese go "alcohol-minded," think Philippine producers, and alcohol will rise to major place in Philippine exports.

Machinery

The following recent contracts have been placed with the General Electric Company of China, Ltd. for British Machinery for installation near Shanghai :—

1.—600 k.w. Fraser & Chalmers Geared Turbo Generator Set with Surface Condensing Plant and Switchgear.
The Turbo will be manufactured at the G.E.C.—Fraser & Chalmers Engineering Works, Erith, and the Generator, also Switchgear, at the General Electric Co., Witton Works, Birmingham.

4.—Power and Lighting Steam Sets totalling 660 k.w. consisting of G.E.C. Witton Generators direct coupled to "Allen" Steam Engines, complete with Ejector Condensers.

The Generators also the Control Switchgear will be manufactured at the G.E.C. Witton Works, Birmingham.

The Sarda Canals Scheme in India

A Fine Installation of Steel Sluice Gates

OF great interest to the Far East is that the Sarda Canals irrigation barrage scheme on the Nepal-United Provinces Frontier in India, which was commenced in 1923, is now completed, the opening ceremony having been performed on December 11, 1928, by the Governor of the United Provinces (Agra and Oudh), H. E. Sir Malcolm Hailey, B.A., G.C.I.E., K.C.S.I.

We are able to reproduce herewith several photographs of this installation, which is the greatest irrigation barrage scheme in the world, having been brought to a successful termination in the face of enormous difficulties. The main object is to provide sufficient reserve of water to eliminate the serious danger of famine in the Province of Oudh, and also to a lesser extent in the adjoining Agra Province, now partly supplied—although not to a sufficient degree—by the Ganges, Tumna, and Agra Canals.

Sarda Canals Scheme. Showing in the Center the Main Sarda Canal Split up into two Branch Canals. "Hardoi" Canal on the Left and "Kheri" Canal on Right, with also an Escape Channel on the Right

The main barrage, shown in the photograph, is situated across the Eastern Channel of the River Sarda at Banbassa, at the foot of the Himalayas. Practically the whole of the Sarda River is in the Independent State of Nepal, representing a drainage area of something like 6,400,000 acres, and at Banbassa the river is comparatively shallow and of low velocity, although having a normal flow in the cold season of 5,560 cubic feet of water per second.

The main barrage is 1,065 feet long, being controlled by a series of steel sluice gates, as shown, impounding the water just as it enters the Plains of India, and discharging, as required, in the dry season through a complete series of feeder canals, controlled by subsidiary barrages with sluice gates.

Ever since 1870 numerous schemes have been drawn up for utilizing the Sarda River, and the total cost of the present scheme is about 7½ crores of rupees, while the area of land in Agra and Oudh being irrigated is no less than 1,382,400 acres. It is calculated that the revenue received will pay 7.9 per cent. interest on the capital as against 7.4 per cent. for the average irrigation scheme in India.

The whole of the steel sluice gate equipment for the different barrages, representing over 2,200 tons deadweight of steel, has been supplied by Messrs. Glenfield and Kennedy Ltd., of Kilmarnock, Scotland. Included in the contract was 30 mild steel sluice gates 50-ft. 0-in. span by 11-ft. 0-in., and 4 mild steel sluice gates 50-ft. 0-in. span by 13-ft. 0-in. deep, complete with free rollers, rocking paths, staunching tubes, lifting attachments, and adjustable plates on the bottom of each of the gates, together with all the necessary gearing and other appliances for operating the same, as well as 16 gates 20-ft. 0-in. span by 6-ft. 4-in. deep, all complete as before with the necessary operating gear and accessories for the intake to the main irrigation canal.

The scheme also includes the utilization of part of the Deoha River bed as a canal, and for this purpose a subsidiary barrage is situated just north of the small town of Bareilly on the United Provinces Frontier, about 160 miles north of Lucknow as the crow flies. The length of the barrage necessary for the river between the extreme abutments is 530 feet, and 11 "Glenfield" steel sluice gates are installed, each 40-ft. 0-in. span by 12-ft. 0-in. deep, of the free roller type, operated by hand control gear from the steel superstructure above. Also four regulator sluice gates are fixed in the canal, this main Deoha River barrage being opened in time of flood but closed during the dry season.

It is difficult to give any adequate idea of a vast scheme of this character, which is a triumph for British engineering, but the extent to which scientific irrigation has been developed in India, can well be expressed by the statement that for this work there are now in operation over 67,000 miles of main and branch canals in British India alone, apart from the purely native states such as Hyderabad, serving about 28,000,000 acres of soil and producing each year crops worth approximately £100,000,000.

Sarda Canals Scheme Main Barrage at Banbassa

New Road Extension Between Chinchou and Palichuang

Between the Nagai Cotton Spinning Mill at the New Town, Chinchou, at an hour's train journey from Dairen, and Palichuang, a span of about 60 meters of the road this side the Chilichuang river ferry has been mostly washed away by the repeated freshets, making the road almost impracticable. The Nagai Mill people having placed unconditionally at the authorities' disposal an area of land belonging thereto, the Civil Administration people jumped at the offer and have proceeded to build a continuation of the road through the same land area. The new extension road is 36-ft. wide and is protected with a retaining wall made of stone, 7-ft. high. The new road will be kept above interruption even in and after stormy weather.

Engineering Notes

ELECTRIC LIGHT, POWER AND TRACTION

YAMAGUCHI PREFECTURE POWER PLANTS :—In order to meet an increasing demand for electric power, the Yamaguchi Prefecture is planning for the extension of its steam power plant at Ube City. The plan reported is to install an additional 45,000 k.w. generator at No. 2 Steam Power Plant at Ube. When this installation is completed, the present No. 1 and No. 2 plants will be put in reserve and the new equipment is to be operated at full capacity.

The budget for the above plan is estimated at Yen 8,000,000. Added to the present prefectural electric bonds of Yen 40,000,000 (of which Yen 3,000,000 redeemed), this will make the total investment in electric business of some Yen 50,000,000.

INDUSTRIAL

BRUNSWICK CORPORATION TO BUILD IN JAPAN.—A million dollar American gramophone plant capable of producing more than a million records a month will be constructed in Yokohama within the next year or so to compete with the Columbia and Victor companies, as well as Japanese manufacturers, according to Mr. E. C. de Villaverde, export manager of the Brunswick-Balke-Collender Company of Chicago.

ONODA CEMENT EXTENSION PLAN.—According to the Onoda Company's tentative plan for business expansion, the Company will establish a factory in Keishodo, Chosen, where some 600,000 barrels will be manufactured, and build a factory in Mie Prefecture, from which some 1,000,000 barrels will be produced, and another factory in Okayama Prefecture, from which 600,000 barrels will be yielded.

It is generally considered that the realization of the Onoda's plan will add poignancy to the depression of the cement market in Japan.

JAPANESE STEEL PRODUCTION.—Acting Commercial Attaché J. H. Ehlers, Tokyo, cables that the production of steel in Japan over the first six months of the current year set a new record for the industry. The actual estimates on which this statement is based were not given, but it was stated that in addition to crude steel the output to black steel sheets had been particularly large. It was also reported that an unnamed Japanese company is considering the establishment of tin-plate mills, tin plate not now being produced in Japan to any appreciable extent.

ENGINEERING WORKS IN SIBERIA.—Steps are being taken for the construction of a big engineering works in Siberia. Siberia's share in the total quantity of agricultural machinery and tools required in the Soviet Union is placed at 20 per cent. ; the area sown this year is 8,000,000 hectares (20,000,000 acres) and at the end of five years is expected to reach 11,000,000 hectates (27,500,000 acres). At present, the production of agricultural machinery and tools in Siberia is very far from covering requirements, with the result that a large quantity has to be imported from European Russia. It is estimated that this year, for instance, the cost of transporting this machinery will amount to 4,500,000 roubles (£450,000) ; moreover, time is lost and the Siberian railway becomes congested.

The new works will manufacture tractor requirements exclusively and the value of the yearly output is fixed at 46,000,000 roubles (£4,600,000). Novosibirsk is the proposed site, and the cost of the works will probably be about 23,000,000 roubles £2,300,000).—"*British-Russian Gazette.*"

OGURA SEKIYU K. K.—(Ogura Petroleum Co., Ltd.) The construction of the Shin Koyasu Oil Refinery has just been completed, and trial runs are being made at present. New products will be sold on the market some time this month. This refinery is using vacuum process of refining. It is also reported that gasoline cracking equipment will be installed before long, probably Jenkin's which is now installed at the Oshima Refinery of the company. The productive capacity of the new equipment is expected to be some 50,000 to 60,000 cases a month.

JAPANESE COTTON SPINNERS STILL INCREASING SPINDLES.—The number of spindles installed on July 1 (night work abolished from this date) of the Japan Cotton Spinners' Association was 6,386,154 spindles. Of this 33,348 spindles were sealed on account of production limitation, deducting which the net number of spindles in operation was 6,353,306.

Extensions due to the abolition of night work had been completed on the whole before the end of June, but some companies are still planning or carrying on extensions. This delay is largely attributed to financial circumstances. According to the report of the Japan Cotton Spinner's Association (from July to August 7), extensions now being carried on and extensions planned are summarised as follows .

Name of Company	Name of Mill	Number of Spindles
Kishiwada Boseki	Main Mill	9,240
Ntsumi Boseki	Main Mill	12,284
Yoshimi Boseki	Main Mill	9,240
Toyo Mosurin	Manamachi Mill	4,800
Tenma Orimono	Johoku Mill	16,000
Tenma Orimono	Mikuni Mill	16,000
Godo Boseki	Akaho Mill	1,600
Asahi Boshoku	Main Mill	2,424*
Toyo Boseki	Ichinemiya Mill	27,648*
Wakayama Senko	Main Mill	2,000*
Tsuji Boseki	No. 1 Mill	2,388*
Kinka Boseki	Kanazawa Mill	31,080*
Fukushima Boseki	Fukuyama Mill	4,608*
do.	Harima Mill	10,400*
do.	Sakai Mill	688*
do.	Tokushima Mill	8,800*
do.	Kurayoshi Mill	9,984*
Matsuda Mempu	Ujun Mill	4,304*
Izumi Boseki	Tadaoka Mill	20,000*
Sampo Boseki	Marugame Mill	21,008*
Omi Hampu	Yawata Hama Mill	20,000*
Kanegafuchi Boseki	Tokyo Mill	2,928*
do.	Takamatsu Mill	7,200*
do.	Saidaiji Mill	8,256*
OsakaMeriyasuBoshoku	Main Mill	16,800*
do.	Tsukuda Mill	2,328*

*planned

Total : Under Construction 156,148 spindles
Planned ... ... 116,860 ,,

These extension will probably be completed before the end of October this year, some of them in August.

SOUTH MANCHURIA POWDER MFG. COMPANY.—Mr. K. Yamagami, one of the oldest residents of Fushun, the seat of the world-famous collieries, has promoted the South Manchuria-Powder Mfg. Co. on the capital of Yen 500,000 at Lichiakou, Yangpaipu, Fushun. The new factory aims at supplying percussion cups, fuses, blasting powder, etc. for the use of Fushun Collieries that require 2,000,000 cylinders of them annually. The Japan Gun Powder Mfg. Co. and the Manchuria Blasting Powder Co., Antung, too, are both interested in the new venture.

In order to expose no existing real estate to danger, a site of 15,000 tsubo has been selected at Lichiakou. Altogether 36 buildings of 650 tsubo in total floor space are to be erected, to be finished by November next.

When the new factory gets into good working order, all the wants of the Collieries will be amply supplied, even against the proposed raise of the estimate mining outputs of over 8,000,000 tons coal for the fiscal year 1930.

The new Company's Directorate are President K. Yamagami, President Yoshiya of the Antung Company, for Managing Director and Mr. N. Kaizuka of the Japan Fuse Mfg. Co. for Director and Manager, besides two more Directors. One of the two Auditors is Mr. T. Inouye of the Manchuria Hemp Mfg. Co., Dairen.

RAILWAYS

THE TURKESTAN-SIBERIAN RAILROAD.—The report of the Workmen's and Peasants' Inspection (R.K.I.) reveals a number of deficiencies in the construction of the Turkestan-Siberian Railroad. Although the survey was made in 1927, in 1928 it had to be done over again, and the carrying on of survey work simultaneously with construction brought some disorganization in the latter. The R.K.I. noted several failures of the management of this railroad construction, the most important of which is the inefficient utilization of the machines, especially those imported from foreign countries, on the southern section of this road. Supply work is carried without any system. Cases are known where certain materials, abundant in one sub-division, are scarce in the next.

In spite of these defects, certain improvements are acknowledged by the R.K.I. The renewed survey work of 1928 and revised planning resulted in great savings in the cost of excavation, building of bridges and buildings, etc. The total savings are estimated at 37 million roubles.

The Council of People's Commissars and the Commissariat for Transport have instructed the management of the "Turksib" to take all necessary measures to insure the connection of the northern and southern sections in 1930, and to make this road ready for commercial exploitation in 1931. For this purpose it will be necessary to organize maximum utilization of machinery, to improve the supply work, to organize labor, and to strengthen the labor discipline.

JAPANESE RAILWAY EXTENSION CONTINUES.—Japan's land traffic has made a rapid development in recent years. The Imperial Government Railways have now a total length of 8,500 miles and the private railways 3,700 miles. The length of private trolley lines is 1,700 miles, the aggregate being 14,000 miles. The recent phenomenal development of the motor car business makes a feature of Japanese traffic.

Dr. Sango Satake, former Parliamentary Vice-Minister of Railways, said that the present growth of traffic other than the railways will surely affect the Imperial Government railway traffic in the near future.

The Minseito Cabinet's retrenchment policy will cut this extensive railway construction program to a very small scale, involving expenses of only about Yen 40,000,000, half of the Yen 80,000,000 planned by the Seiyukai Cabinet for the annual payments, Dr. Satake said. The present railway authorities are likely to hold down railway construction, taking into consideration the growth of motor traffic.

UBE TETSUDO K.K. (Ube Railway Co., Ltd.)—The electrification work of this company, covering some 20 miles, has been nearly completed, and the electric motors ordered from Germany are expected to arrive some time during September, so that trial runs will be made before the end of September, it is reported. Operation of electrified railway will be started early in October.

CHINA'S RAILWAYS.—A program for the construction of a network of railways throughout the country to be completed in four periods has been formulated by the National Highway Planning Committee under the Chairmanship of Minister of Railways Sun Fo. The trunk lines through the interior will be completed in ten years, while those lines along the western border will be completed in twenty years. A list of the railways to be constructed in the four stages is given below :

1. First Stage.—The entire line of the Nanking-Liuchow Railway ; the Nanking-Tali section of the Nanking-Yunnan-Sikong Railway ; the Yuanto-Chengtu section of the Nanking-Tibet Railway ; the Wuchang-Lanchow section of the Foochow-Sinkiang Railway ; the Paotow-Hsining section of the Suiyuan-Sinkiang Railway.

2. Second Stage.—The Lochow-Siangyang and the Shasi-Chengtu sections of the Nanking-Yunnan-Sikong Railway ; to Foochow-Wuchang and the Lanchow-Tihwa section of the Foochow-Sinkiang Railway ; the entire line of the Nanking-Mongolia Railway ; the entire line of the Nanking-Heilungkiang Railway ; and the entire line of the Shensi-Kwangsi Railway.

3. Third Stage.—The Tali-Patang and the Changning-Cheyu sections of the Nanking-Yunnan-Sikong Railway ; the Chengtu-Jutien section of the Nanking-Tibet Railway ; the Tihwa-Ili section of the Foochow-Sinkiang Railway ; the entire line of the Chang-Yuan Railway.

4. Fourth Stage.—The entire line of the Kansu-Tibet Railway and the entire line of the Tihwa-Suchow Railway.—Kuo Min.

THE SIAM STATE RAILWAYS.—The Siamese Government has decided to electrify the railway lines around Bangkok which will take about five years. The sanctioned program includes :—

(1) electrification of the line from Bangkok to Ban Phaji ;
(2) electrification of the Eastern line to Makasan and the River station ;
(3) electrification of the Rama VI bridge line to Taling Chan ;
(4) electrification of the Southern line from Bangkok Noi to Nakon Pathom.

The cost will run into several millions of ticals, and envisages the complete reconstruction of the existing Government Power Station. This station is to be the central distributing point ; there may be sub-stations on the lines electrified, but the power will in the first instance be generated at Samsen.

It is the intention of the Government to ask well known firms in Europe and America to prepare schemes and tenders.

The steam engines now in use in and around Bangkok and those now on order will not be scrapped because electric haul is to be substituted, since this stock will become available for the extensions on the lines to Khon Khaen and Ubol. The full complement of engines required to operate these extensions has not been ordered because the electrification scheme was under consideration.

The rolling stock as it exists at present will all be available for haulage by either means of propulsion.

Under the scheme, the reorganized Government Power Station, much of whose plant is already obsolete compared with present day power plants, will sell its current to the Railways. In this re-organization of the central power station provision will be made for the needs of the new Thonburi, which may be expected to come into being as soon as the Memorial bridge is completed. Moreover the electrification of the railway in the districts enumerated will in turn lead to the provision of the facilities for power and light being made available to towns and centers within a reasonable distance of both sides of the track.

RAILWAY PURCHASES IN CHINA.—It is learned that a sum of $1,600,000 from the returned Belgian Boxer Indemnity Fund will be used by the Ministry of Railways for the purchase of rolling-stock for the various Government railways. The greater part of the sum will be used to provide the Tsin-Pu Railway with two complete new passenger trains, and the rest will be for the purchase of a number of freight cars for distribution among the different Railway Lines.—*Kuo Min.*

NEW KIRIN-TUNGKIANG AND MISHAN-MULING LINES.—The Kirin Provincial Government, in view of the Soviet-Chinese strain demanding an enormous outlay for warlike preparations, is putting off the proposed construction of the Kirin-Tungkiang line and also the Muling-Mishan line as well.

Since the latter part of June, the surveys for the Lishuchen-Mishan section of Muling-Mishan line which is opened to traffic as far as Lishuchen have been carried out. Again, the surveys from Chuho to Fangcheng being part of the Kirin-Tungkiang line have also been finished.

SHIPPING AND SHIPBUILDING

N.Y.K. WILL EXTEND SERVICE TO MANILA.—The N.Y.K. Orient-California service will be extended at the beginning of next year, when the *Taiyo Maru, Tenyo Maru,* and *Shinyo Maru* will call at Manila. At present all the vessels on this run have Hongkong as the terminus in the Orient.

At present the service is operated with the *Korea Maru, Siberia Maru, Tenyo Maru, Taiyo Maru* and *Shinyo Maru* on a fortnightly schedule, the ports of call being Los Angeles, San Francisco, Honolulu, Yokohama, Shimizu (occasionally) Kobe, Nagasaki, Shanghai and Hongkong.

When the new motorships *Asama Maru, Chichibu Maru* and *Tatsuta Maru* are placed in the trans-Pacific service, the *Korea Maru* and *Siberia Maru* will be shifted to the company's Seattle line. The San Francisco line will then be operated with six vessels. Taking advantage of this increased accommodation and the speed of the new motor ships, 19 knots, it is planned by the company to send the *Taiyo, Tenyo* and *Shinyo Maru* as far as Manila, while the new ships will follow the present service schedule.

NEW N.K.K. RIVER STEAMER LAUNCHED AT KIANGNAN :—The *Lo Yang Maru* was launched at the Kiangnan Dock and Engineering Works on July 24

In type the *Lo Yang Maru* is unique, as being the largest in gross tonnage that has been constructed in Shanghai, expressly for the run between Shanghai and Hankow and intermediate ports. The vessel represents the combined experience of the Company's Superintendents, Captain K. Takeshita and Mr. Susukida and the builders.

The principle dimensions are :—

Length between perpendiculars ..	330 ft. 0 in.
Breadth moulded	48 ft. 0 in.
Breadth over guards	59 ft. 4 in.
Depth to upper deck	24 ft. 3 in.
Height upper to promenade deck .	8 ft. 0 in.
Height promenade deck to boat deck	8 ft. 0 in.
Guaranteed speed	15 knots
Indicated horse-power	3,300

The vessel has been designed for service on the Yangtze River as a first class passenger and cargo steamer. The hull is constructed of mild steel plates and sections tested to the requirements of the Tunshinsho Rules and the British Corporation and has been built under the special survey carried out by the surveyors of these classification societies. Broad sponsons are fitted along both sides of main deck and vessel has a straight stem and elliptical stern.

A centre lattice girder is fitted fore and aft, with six transverse watertight bulkheads, main and upper decks are complete steel decks with wood sheathing where necessary. Promenade, boat and shade decks are a combination of stringer and tie plates with wood sheathing covered with painted canvas laid over felt. The upper deck forward is sheathed with teak.

Passenger cabins are arranged on upper deck for 32 first class passengers , 38 second class and 172 third class. Cabins are arranged on the promenade deck for 20 foreign first class passengers, and 10 foreign second class passengers, also cabins for pilots and officers.

The captain's cabin and wheelhouse, smoking room, palm house cafe, lounge and Japanese social hall are constructed on the boat deck. A steel mast is fitted forward with one 10-ton derrick and two 5-ton derricks of steel tubes, with steam winches for the quick handling of heavy weights.

The *Lo Yang Maru* is driven by twin screws whose shafts are operated by two engines of the inverted direct acting triple expansion surface condensing type, turning outwards when running ahead and working on three cranks with cylinders and slide valves arranged in fore and aft line. Condenser is of the " Uniflux " type common to both engines. Air, feed and bilge pumps are driven by levers off the main engines. Three Scotch boilers fitted with Howdens forced draught working at a pressure of 200 lbs. per square inch supply amply steam to develop about 3,300 I.H.P.

Electric light is fitted throughout and current is supplied to fans, lights, electric heaters by two steam driven dynamos, one of 27 K. W. and the other 15 K. W.

The steam windlass and capstan is of Emerson and Walkers latest design. The steam steering gear is placed directly over the rudderstuck in a steel house and is of Donkin's latest type with telemotor gear and standard on navigating bridge.

The dining saloon will be finished in a fashionable and artistic manner, the side wall panellings are of five-ply oak with teak frames, the upper parts of which are covered with silk. The ceilings are panelled in five-ply brick enamelled white. The fire place is of solid teak with marble hearth set in the centre with special " Magicoal " electric fire by the General Electric Co. of China. An imitation coal fire giving a realistic flame and smoke effect throwing but considerable heat. The upholstery is in harmony of colour and good taste.

The lounge and music room in design is a combination of modern and ancient classical style. The upper part of the panelling is of birch and covered with Damask tapestry and the lower panelling is of birch with teak frames painted in white enamel for lighting effect. Overhead is a large dome skylight finished in stained leaded glass with flower design. Round this dome is arranged soft concealed strip lighting which will give a very pleasing effect. To eliminate noise the floor is covered with coloured " Rublino." The room is fitted with a grand piano, easy chairs, settees, card tables, writing desk and small chairs. A refreshment bar is arranged adjacent.

The main stairway to the first class saloon is of specially selected teak, with two Grecian Pegasus carved on the main pilasters. A clock in suitable carved panelling surmounts a specially selected picture by a famous Japanese artist, completes the design.

The smoking room is a reproduction of the Elizabethan period. The walls are panelled in teak with characteristic doors having silver plated mountings. The ceilings are panelled in birch and teak. The windows are large oblong " Crittal " windows. Four angular cosy corners are arranged in the room and mahjong tables are fitted in each. Historical shields are worked into the design of the panellings. A teak fire place in keeping with the period encloses a marble hearth and an electric imitation coal fire. This floor is also covered with delicate coloured " Rublino," and due regard has been paid to the comfort of passengers in the provision of settees and easy chairs. A leaded glass dome is fitted to this room from the centre of which hangs a beautiful bronze chandelier with electric candles giving a soft effect to the whole. Ceilling fans are fitted throughout the accommodation.

The Japanese social hall situated on the boat deck is designed by a Japanese architect and the special timber materials were imported from Japan. The floor is laid with 15 Tataimi The room is fitted with Tokonoma, Chigaidana and Shoin.

NEW TYPE GERMAN FAST FREIGHTER.—The s.s. *Isar*, one of a new class of fast freighters that have recently been put on the China-Japan run by the Norddeutscher Lloyd, is a very interesting vessel and is the first to visit China having the new type of bow designed by an Austrian engineer named Maier in the German Shipbuilding & Engineering Works, Hamburg, where the *Isar* was built. The design is called the Maier-Wien and its objects are to give greater seaworthiness in a head sea. It also gives more speed on the same consumption. Looking head on, the bow gives the appearance of an icebreaker, having a considerable flare. It has already been thoroughly tested out on trawlers and other vessels with great success.

The ship is a modern fast freighter, replete with all modern gear for handling cargo, including two derricks for heavy lifts, one for 50 ton and one for 30 ton, and has 1,000 tons refrigerating space for perishable cargoes. Carrying capacity is 12,160 tons; gross tonnage 9,026; length overall 546 feet; beam 64 feet; draft 27 feet, 11 inches; speed fourteen and three quarter knots making the run between here and Marseilles about 29 days. The normal accommodation is for fourteen first class passengers, berthed in seven single berthed cabins and four double berthed cabins but two more can be carried. The accommodation for passengers is situated on the upper deck, which has rather more space than is usual in this class of ship and which is greatly appreciated by the passengers.

MITSUI SHIPPING SECTION.—In view of the fact that the conversion of steamers into motorships is a main current in shipping circles and that freightage by motorships is becoming the standard to the shipping concerns, the shipping section of the Mitsui Busan Kaisha, which ranks first as the big Diesel ship-owners among the independent concerns, is planning to replace its steamships by motorships within the next 10 years.

According to the tentative schedule, the Mitsui Bussan will construct several Diesel ships of large size, which will be placed on the Pacific route, and several small size boats, which will be placed on the Chinese coast and coastwise routes. Construction orders will be placed when the Government decides the definite attitude for the gold export ban question.

JAPAN-CANTON DIRECT STEAMER LINE SCHEME.—The O.S.K. has decided upon the long proposed direct steamer service between Japan and Canton. The first steamer *Nitto Maru* on this run is expected to commence service immediately.

The O.S.K. people have thought of taking the present chance to revive the trade with Canton. Its idea is to insure quicker arrival of goods, cheaper freights, and economy of insurance costs by opening a direct service, compared with the old transhipment arrangement.

The *Nitto Maru* and the *Koshi Maru* of 2,200 ton class are to ply a twice monthly regular line, leaving the intermediate ports of call to an optional change according to the cargo-owners' wishes.

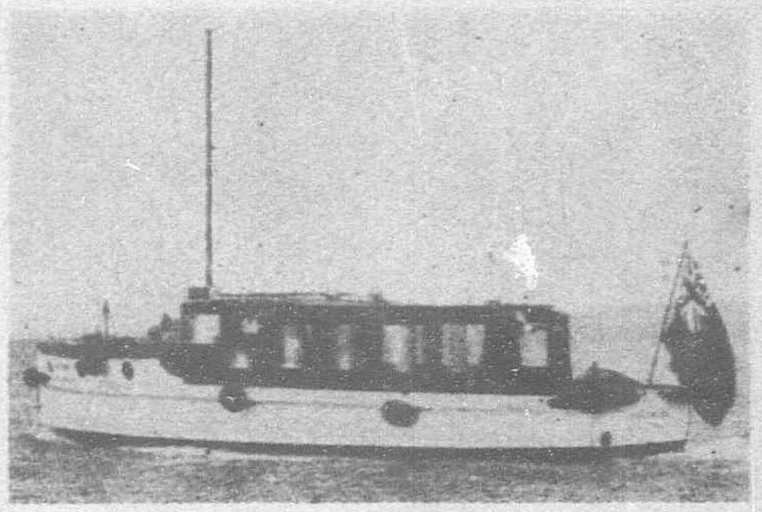
C.P.R. WILL MAKE CALL AT HONOLULU—The Canadian Pacific Steamship Company has made an announcement that commencing with the *Empress of Canada*, which leaves Vancouver on December 7, calls will be made at Honolulu.

While the call at Honolulu westward will necessitate a few days additional time spent in reaching the Orient, there will be no alteration in the time at present required to make the trip from Yokohama to Manila and from the latter port to Vancouver.

The engines of the *Empress of Canada* it was announced, have been reconditioned in order that the liner may conform with the speed of the new *Empress of Japan* now under construction in Europe, which is 21 knots. The *Empress of Japan* is nearing completion. This liner is an oil burner of 25,000 tons gorss register; 640 feet in length, 83 feet 6 inches in breath and is scheduled to make her maiden voyage from Vancouver on July 10, 1930. The *Empress of Canada* will also call at Honolulu on the voyage westward.

Two other liners of the C. P. fleet that will call at Honolulu on the trip westward are the *Empress of Russia* and the *Empress of Asia*, but only during the winter months. The first trip of the *Empress of Russia* to Honolulu will be made on December 21. The *Empress of Asia* will follow on January 11, 1930, and the *Empress of Russia* will make her second trip on March 8. These will be the last calls to Honolulu of these steamers until the winter of 1930.

A PILOT LAUNCH BUILT AT SINGAPORE.—The cabin launch *Saltacre* has recently been completed at Thornycroft's Singapore yard for the use of one of the local pilots. The boat measures 41-ft. 6-ins. overall, the beam being 8-ft. 6-ins. and the draught 2-ft. 6-ins.



"Saltacre" at Singapore

The power plant is a 40 h.p. four-cylinder Thornycroft petrol engine, which gives a service speed of over 10 m.p.h.

It is worthy of record that for the large number of craft completed at this Singapore yard native boatbuilders are employed.—*The Motor Boat.*

TELEPHONE, TELEGRAPH AND RADIO

FUSHUN COLLIERIES SERVICE TELEPHONE—The purchase of an additional Strowger installation from Chicago and laying a subterranean cable from the existing Telephone Exchange to East Jujodori will consume most of the fresh outlay by the Post Office amounting to Y.130,000. The technical part of the work of connecting the Fushun Collieries with an automatic system will not be completed before the current year is out, so that the connecting traffic may be inaugurated early next year. On the part of the Collieries they are to pay a stipulate sum to the Post Office when the connection between the two systems is opened.

The change will involve the installation of 950 new apparatus. Once the proposed connection is effected, the Fushun telephone service will have 1,620 subscribers on the list, the third largest number in South Manchuria after Dairen and Mukden.

NEW COMMUNICATION SCHEME IN CHINA.—In connection with the proposed public loan of ten million dollars ($10,000,000) by the Ministry of Communications for the improvement of the Chinese Telegraph Administration, it is learned that the fund will be exclusively devoted to the following purposes:—

1. To pay the outstanding debts of the Administration due to the Great Northern and Eastern Extension Telegraph Companies.
2. To install a number of radio transmitting stations to replace the foreign radio stations.
3. To effect repairs to dilapidated telegraphic lines.—*Kuo Min.*

AUTOMATIC PHONES IN MACAO.—The Siemens China Company have installed the automatic telephone system at Macao. Work has now commenced on the final stages and it is expected that the system will be in operation all over Macao presently.

The contract between the Government of Macao and the Company provided for the setting up of a service capable of carrying two thousand lines; but of this number only one thousand will come immediately into operation. Lines to all points in the colony were laid along the principal routes by subterranean cables some months ago, since when work has been proceeding with the connections and wiring at the Exchange.

Preparations for the final stages of the work at the Exchange have been going on for some months, and a few days ago the remaining parts of the equipment arrived from Europe, and with them expert engineers of the Siemens China Company from North China to complete the final and most complicated connections.

The system is automatic in every way.

The cost of machinery and the work of installation will be included in the $100,000, which the Siemens China Company accepted for putting in the system. This works out at about $500 for each telephone.

WIRELESS IMPORTS.—The National Government officially promulgated the following laws regulating the importation of wireless materials into China.

The laws shall regulate the importation of all wireless materials, including wireless telegraph and wireless telephones.

Before wireless materials can be shipped into any Chinese harbor, the importing firm shall submit the invoice and a statement, giving a detailed description of the materials and their value, to the highest local authority which shall in turn forward these documents to the Ministry of War for examination. Unless the firm obtains a huchao from the Ministry, the wireless materials cannot enter Chinese territory. In case the importing firm is doing business in a foreign Concession, the firm must send in its application for a huchao to the nearest local authority which shall forward such application to the Ministry.

If a firm is importing any wireless materials for a second time, the firm must submit also a statement showing the name of the party to whom the materials have been sold and the present address of that party. No huchao will be issued to that firm if the statement is found to be incorrect.

In any period of military activities when it is found necessary by the Ministry of War and the Chief of Staff Department to prohibit any importation of wireless materials, such huchaos may not be issued.

Any firm which imports wireless materials without any huchao shall be duly punished by the Ministry of War.

Ten dollars for huchao fees and $2 revenue stamp must be submitted by the firm which sends in an application for the importation of wireless materials.

The Ministry of Communications and the Reconstruction Committee may import wireless materials, using only their own huchao, but must notify the Ministry of War.

MINING

QUICKSILVER MINE DISCOVERED IN KARAFUTO.—A new company is being promoted in order to exploit a new quicksilver mine recently discovered in Karafuto at Toriizawa. The quality of quick silver produced at this mine is said to compare favorably with those of Spain. The new concern is to be known as the Nippon Suigin Kogyo Kabushiki Kaisha (Japan Quicksilver Mining Co., Ltd.), with a capitalization of Y.300,000. For the construction of a refinery the company will spend about Y.300,000 and some Y.100,000 more for other equipments.

PUBLIC WORKS

BANGKOK CONTRACT FOR BRIDGE.—It is announced that the contract to build a new Bangkok memorial bridge, in celebration of the 150th anniversary of the foundation of the city, has been awarded to Messrs. Dorman, Long & Co., of Middlesbrough, against American and Continental competition. The bridge will cost £250,000.

SINGAPORE BASE.—The Aberdeen engineering firm of John Henderson & Co., has received an order from Sir John Jackson (Singapore), Ltd., the main constructors of the Singapore naval base, for the construction of eight electrically-driven travelling aerial cableways in connection with the construction of docks, dock walls, and wharves at the naval base.

CANTON WATER SUPPLY.—A contract was recently signed by Dr. Wu Pak-liang, Commissioner of the Canton Municipal Waterworks, with the Patterson Engineering Co., Ltd., a British firm, for a plant for the rapid filtration and treatment of 10,000,000 gallons of water per hour, states a southern exchange.

The general method adopted, which may be varied to suit local conditions, is that of treating the raw water with lime and coagulents, passing to settling tanks and then filtration through rapid gravity sand filters constructed of ferro-concrete and filled with graded sand through which the water circulates at the rate of eighty gallons per square foot of filtering surface per hour. The water is then treated by the "chloronome" process, which adds continually about one part of chlorine gas per 2,000,000 parts of water, giving complete sterilization without leaving any trace of taste or smell.

The raw water is to be taken from the Canton River, about six miles from the city, and pumped to the filters by means of three electrically-driven low-lift pumps, each capable of handling 5,000,000 gallons per hour, one pump being a spare. There will be a battery of sixteen of these filters. The total cost of the whole equipment, including pumps, pipes, and other accessories, is approximately 2¼ lakhs of Hongkong dollars (about £23,000). The contract was secured in the face of severe foreign competition.

BIG IRRIGATION PROJECT IN SUIYUAN.—The work has been formally started on the $600,000 irrigation project which is to put water from the Yellow River on to some 12.000 square miles of fertile land in the Saratsi region and permanently end the series of famines due to drought which have afflicted this region for many decades.

The construction work on the irrigation project is in charge of the China International Famine Relief Commission. The Suiyuan government is putting in $250,000 for the work. The balance of the cost comes from various sources, chiefly the United States, through the C.I.F.R.C. The money put in through the C.I.F.R.C. is on a loan basis, to be returned out of receipts from the sale of water after the irrigation is started. The C.I.F.R.C., is to have control of the operation of the plant until the money thus loaned is returned in full, with interest. Thereafter the plant is to go to an organization of the local gentry and officials for operation.

With the work moving forward smoothly, it is expected that the entire project will be completed about the middle of October, with the possible exception of some culverts and bridge work. This will get the main work done before winter sets in, and when spring comes there will be water to put on the land in this area. The land itself is very rich, but for many years the rainfall has been undependable. Some years the crops were excellent; then would come a year or two or more with practically no rain—and no crops. There has been no rain, except very small local showers, in this whole Saratsi-Paotow region for the past three years.

HUAI RIVER CONSERVANCY.—Work on the dredging and widening of the Huai River will be started shortly following the establishment of the Engineering Office at Tsingkiangpu, it is announced by the Huai River Conservancy Board. To provide the necessary construction expenses a public loan of $30,000,000 will be issued as soon as the State Council has given approval to the regulations governing the amortization of the principal and payment of interest on the proposed loan.—*Kuo Min.*

NEW HARBOR AT TONGSHAN.—A new harbor with all modern shipping facilities will be completed at Tongshan by 1934 if the programme laid down by the National Reconstruction Committee can be carried out. According to the scheme which is based upon the programme for the period of political tutelage as laid down by the late party leader, the current year's programme calls for the construction of stations for the observation of weather conditions, the tide and other natural phenomena in the locality. For 1930 the general outline for the construction of the port will be laid, the most important part being the construction of a breakwater for the harbor. In 1931, buoys will be laid, and warehouses constructed along the entire water front to facilitate shipping. The authorities hope that by the year 1934 the general outline of the port will be completed, when the actual development can then follow.

AVIATION

$1,000,000 LOAN FOR AIR MAIL.—At a State Council meeting Mr. Sun Fo, president of the China National Aviation Corporation, submitted for its approval a proposed contract with the Aviation Exploration Inc. of America for a loan of not more than $1,000,000. The contract which had been signed on July 16 by Mr. Sun Fo, on behalf of the China National Aviation Corporation, and Dr. George Sellett, Attorney-in-Fact of the American firm, was approved by the State Council.

The American company agrees to advance to the China National Aviation Corporation a sum of not more than $1,000,000 for the purchase and improvement of land which will be used for airports and intermediate landing fields on the proposed Shanghai-Hankow, Nanking-Peking and Hankow-Canton air mail lines. The money is to be refunded to the American firm by the Chinese corporation on or before January 1, 1938, bearing an annual interest of 6 per cent.

According to the contract signed between the two parties on April 27, the construction of adequate airports and intermediate landing fields should be completed within six months from the date of the conclusion of the above contract. It is now mutually agreed, however, that air mail service on the Nanking-Peking and Hankow-Canton lines shall not begin until January 17, 1930. The Shanghai-Nanking-Hankow air mail line began operation in the middle of October.

DOLLAR LINE PLANNING NEW AIR TRANSPORT COMPANY.—Mr. R. Stanley Dollar in an interview discussed the new steamship corporation which is to be capitalized at G.$100,000,000 and which, it is stated, will be the largest American shipping concern. The new corporation is to be known as the Dollar Lines, Inc. The increased capital, it was explained, as the result of the new organization will give the company an opportunity to build larger steamers to be used on a quicker schedule for the round-the-world service.

Mr. Dollar also discussed air transportation. The proposed air line project of the company, which is to involve an outlay of G.$10,000,000, will be in the form of a subsidiary means of transportation under Dollar control, and while not yet completed, Mr. Dollar indicated that the intense interest such a plan has attracted, gives every indication that the air transport company will come into being.

MOTOR CARS

MOTOR-CAR SERVICE IN CHOSEN.—It is understood that the length of motor-car roads in Chosen under the direct management of the Chosen Railway Company and the Chosen Railway Automobile Company reach at present 563 *ri* and the number of cars under operation is 201, of which 78 *ri* with 26 cars operate in Kokai Province, 71 *ri* with 68 cars in South Keisho Province, 228 *ri* with 138 cars in North Chusei Province and 168 *ri* with 68 cars in North Keisho Province. Besides these, the motor car service between Kinson and Shinshu—46 *ri* distant—is expected to be opened soon with 23 cars. Seeing the motor-car service is not only important as a means of traffic subsidiary to railways but has definite prospect of development as independent means of such, it is understood the authorities concerned are planning to expand this important service by constructing new motor-car roads hereafter in spite of the retrenchment policy.

Note 1 *ri* is less than 2½ statute miles.